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Occupational Projections and Training Data

1982 Edition

A Statistical and Research Supplement
to the 1982-83 Occupational Outlook Handbook

U.S. Department of Labor
Bureau of Labor Statistics
December 1982

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to the 1982-83 Occupational Outlook Handbook

U.S. Department of Labor
Raymond J. Donovan, Secretary

Bureau of Labor Statistics
Janet L. Norwood, Commissioner

December 1982

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Preface

Information about occupational demand and supply is needed to plan education and training programs and provide vocational guidance. This bulletin provides detailed statistics on current and projected occupational employment and related information on occupational demand and supply—including new estimates of job openings—for use in these activities. It is a revision and update of Bulletin 2052 of the same title published in 1980, and was prepared as part of the Bureau of Labor Statistics program for developing and disseminating projections of the U.S. economy.

This bulletin was prepared in the Division of Occupational Outlook under the direction of Michael Pilot. Alan Eck and Chester Levine supervised its preparation. Alan Eck prepared the material on occupational movements and replacement needs. Jon Q. Sargent contributed the discussion of job prospects for college graduates, and Thomas Nardone prepared the information on broad occupational trends. The training data were assembled by Verada P. Bluford, John P. Griffin, and H. James Neary. The chapter discussing individual occupations represents the work of economists who prepared the 1982-83 edition of the *Occupational Outlook Handbook*.

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Highlights

Different source of employment data. The Bureau's Occupational Employment Statistics (OES) survey has replaced the decennial census and the Current Population Survey (CPS) as the primary source of data used to develop estimates of current and projected employment. The OES survey obtains data from establishments on the number of jobs while the CPS obtains data from households on the number of people employed.

Range of projected needs. The Bureau has prepared three sets of employment projections. Referred to as the low-trend, high-trend I, and high-trend II alternatives, the projections are based on different assumptions concerning labor force growth, unemployment, output, productivity, and other factors.

Broader definition of replacement needs. CPS data covering the 1980–81 period have replaced working life tables as the basic data used to develop estimates of occupational replacement needs. Whereas deaths and retirements were virtually the only source of replacement needs in previous estimates of job openings published by the Bureau, replacement needs based on the new CPS data include persons who leave an occupation for any reason—including occupational transfers and temporary labor force separations—except death and emigration. The CPS-based estimate of replacement needs for all occupations in 1980 is five times that based on working life tables.

In the past, the Bureau's estimates of replacement needs accounted for roughly 2 out of 3 job openings. Under the expanded definition of job openings, replacement needs are expected to account for about 90 percent of the 23 to 25 million job openings projected annually over the 1980-90 period.

More complete supply-demand information. Occupational supply-demand analysis was severely hampered in the past because job openings data excluded occupational transfers and temporary labor force separations—persons who returned to school or assumed household duties, for example—and data on recent graduates of training programs were the principal or only source of data on supply. The new CPS data provide much more information with which to assess occupational supply and demand.

Updated job outlook for college graduates. Similar to the 1970's, an average annual surplus of between 200,000 and 300,000 college graduates is expected to enter the labor force during the 1980's.

Chapter 1. Introduction

Occupational outlook information presented in career guidance publications such as the *Occupational Outlook Handbook* usually appears in the form of general statements about expected changes in employment and, when data permit, the degree of competition jobseekers are likely to encounter. Descriptive information is considered appropriate because it is more easily understood by the target audience—students. However, education planners, training officials, occupational analysts, and others need detailed statistics on current and projected employment, job openings, and training program completions to evaluate the adequacy of education and training programs. This bulletin is the sixth in a series begun in 1970 that presents the statistical and technical data underlying the information developed in the Bureau's occupational outlook program.

In 1981 and 1982, BLS made significant changes in the sources and procedures used to develop its estimates of job openings. This chapter discusses these changes and indicates how the new data differ from, and why they are not comparable with, information presented in previous editions of this bulletin. It also gives examples of how the information can be used to assess the degree of competition for jobs.

Chapter 2 provides a broad overview of the 1990 economy under different assumptions and discusses projected changes in employment by major occupational group and for all college graduates. Chapter 3 provides an overview of newly developed information about occupational movements in 1980-81, and chapter 4 discusses the outlook for 55 detailed occupations using the newly developed data.

Changes in data on job openings

Job openings in an occupation arise from growth in employment and also from the need to replace individuals who leave the occupation. BLS has changed its methods of preparing estimates of both these sources of job openings.

Employment growth. Estimates of current and projected occupational employment presented in this bulletin, unlike earlier estimates, are based on data collected in the Bureau's Occupational Employment Statistics (OES) surveys. These surveys, conducted in each industry every 3 years, provide more occupational detail than the decennial census and the Current Population Survey (CPS), on which earlier occupational estimates were based. Further, data on occupations derived from a survey of employers, such as the OES survey, are believed to be more reliable than those derived from a household survey, such as the CPS. Because of conceptual and procedural differences between the OES surveys and the census and CPS, the occupational employment estimates presented in this bulletin and in the 1982-83 *Occupational Outlook Handbook* may differ significantly from those developed for the same occupations in the past.[1]

Table 1 provides a comparison of 1980 employment from the OES and the CPS for the major occupational groups. As shown in the table, OES-based employment was higher overall—by 5 percent—and in 7 of the 12 major occupational groups. OES employment ranged from 32 percent higher for nonfarm laborers to 14 percent lower for managers and administrators. Differences were also relatively large for sales workers (11 percent) and service workers, except private household (22 percent). On the other hand, differences were 6 percent or

[1] One major conceptual difference is that the OES survey is a count of jobs while the CPS is a count of persons. In the OES surveys, persons who hold more than one job are counted in each job held; in the CPS, they are counted only in their primary job.

Table 1. Comparison of employment data from the Occupational Employment Statistics survey-based matrix and the Current Population Survey, 1980

(In thousands)

Occupational group	1980 employment		Percent difference
	OES data	CPS data	
Total	102,107	97,270	5.0
Professional and technical workers	16,395	15,613	5.1
Managers and administrators, except farm	9,355	10,919	-14.3
Sales workers	6,822	6,172	10.5
Clerical workers	18,864	18,105	4.2
Craft and kindred workers	12,369	12,529	-1.1
Nontransport operatives	10,679	10,346	3.2
Transport equipment operatives	3,528	3,468	1.7
Nonfarm laborers	5,860	4,456	31.5
Farmers and farm managers	1,484	1,485	.0
Farm laborers and supervisors	1,205	1,218	-1.1
Service workers, except private household	14,559	11,917	22.2
Private household workers	988	1,041	-5.1

NOTE: The Occupational Employment Statistics survey is a count of jobs; the CPS is a count of persons. Other differences in the data are discussed in appendix A.

less for 8 of the 12 groups. Appendix A discusses the reasons for the differences between these sources of data and describes the methodology for developing estimates of employment growth based on OES data.

Replacement needs. The new data on job openings presented in this bulletin include estimates of the need to replace individuals who leave an occupation for all reasons except death and emigration. Replacement needs for persons who transfer to other occupations and those who stop working temporarily—perhaps to return to school or to raise a family—are included.[2] These estimates provide a better measure of total replacement needs than those previously published by the Bureau, which primarily covered permanent labor force separations—deaths and retirements—derived from tables of working life.

Longitudinal data from the CPS have been used to develop new estimates of replacement needs. The longitudinal character of the CPS theoretically permits data to be obtained one year later for 50 percent of the households in each monthly survey. Thus, by matching information from the surveys, individuals in these households can be identified from one year to the next to obtain information on changes in their labor force status and occupation.

The matched data have several limitations which are discussed in appendix B. Briefly, because of response and coding errors, the CPS matched data significantly overstate occupational changes among persons employed in both years. To overcome this weakness, retrospective data from supplementary questions on occupational mobility in the January 1981 CPS were combined with the CPS matched data to estimate annual occupational transfers. These combined data—which provide a composite description of movements into, out of, and between occupations—are termed "merged data."

Table 2 compares estimates of replacement needs in 1980 using the new data based on the CPS and the old data based on tables of working life.[3] The new estimates are 5 times as high as those derived previously from tables of working life. The new CPS data also indicate a different distribution of replacement needs among the major occupational groups. For example, under the CPS-based method, replacement needs in 1980 were relatively larger for nonfarm laborers and smaller for managerial occupations. The difference in the distribution reflects the inclusion of persons who transfer to other occupations or temporarily withdraw from the labor force: Nonfarm laborers are more likely than managers to transfer to another occupation or stop working temporarily.

The new data exclude replacement needs due to deaths because appropriate data are not available. As a result of this exclusion, the estimated replacement rate may be 0.5 percent less than the actual. Appendix B provides additional information about the exclusion of deaths from the data.

[2] An occupational transfer is defined as movement between any of the detailed, 3-digit occupations from the *1970 Census of Population Classified Index of Industries and Occupations* (Bureau of the Census, 1971).

[3] BLS has developed a new set of working life tables based on labor force patterns observed in 1977. The tables also use matched CPS data to measure flows into and out of the labor force. To facilitate comparisons with previous BLS data, however, replacement rates based on working life tables used in preparing *Occupational Projections and Training data, 1980 Edition* (BLS Bulletin 2052) were utilized in table 2. For information about the new working life tables see Shirley J. Smith, "New Worklife Estimates Reflect Changing Profile of Labor Force," *Monthly Labor Review*, March 1982, pp. 15-20.

Table 2. Comparison of replacement needs based on the Current Population Survey and the working life table, 1980

(In thousands)

Occupational group	Replacement needs		Distribution of replacement needs	
	CPS [1]	Working life table [2]	CPS [1]	Working life table [2]
Total	19,809	3,778	100.0	100.0
Professional and technical workers	1,828	497	9.2	12.9
Managers and administrators, except farm	1,081	353	5.5	9.2
Sales workers	1,592	261	8.0	6.8
Clerical workers	4,071	960	20.6	25.0
Craft and kindred workers	1,749	340	8.8	8.9
Nontransport operatives	2,227	303	11.3	7.9
Transport equipment operatives	599	83	3.0	2.2
Nonfarm laborers	1,781	155	9.0	4.0
Farmers and farm managers	135	107	.7	2.8
Farm laborers and supervisors	334	49	1.7	1.3
Service workers, except private household	3,996	668	20.2	17.4
Private household workers	392	65	2.0	1.7

[1] Replacement needs were calculated by applying CPS-based replacement rates used in *Occupational Projections and Training Data, 1982 Edition*, to 1980 OES survey-based employment data.

[2] Replacement needs were calculated by applying working life table rates used in *Occupational Projections and Training Data, 1980 Edition*, to 1980 OES survey-based employment data.

Individuals who move to another area and who must be replaced create additional replacement needs. However, since the Bureau focuses on the employment outlook for the Nation as a whole, replacement needs resulting from geographic movements within the Nation are excluded from the analysis. Replacement needs due to emigration are insignificant and are also excluded.

Assessing the competition for jobs

To assess the degree of competition for jobs, information is needed about both demand and supply. In addition to providing more comprehensive information on demand, or job openings, as explained in the previous section, the new data available from the CPS provide a great deal of information on the characteristics of workers entering occupations. By using these and other data, some assessments can be made of the expected competition for jobs in many occupations. Such conclusions require detailed analyses; simple comparisons of data on job openings and information on new graduates of training programs do not suffice. Following are three illustrations using the newly developed data. The first—for physicians—is an example of an occupation for which quantitative data on supply are readily available and fairly complete. The second and third—registered nurses and food counter workers—are examples of occupations for which quantitative data on supply are limited; they illustrate how qualitative assessments of expected competition can be developed. Chapter 4 presents similar supply-demand information for 55 occupations.

Physicians. Analysis of the supply-demand relationship for physicians is facilitated by licensure requirements and unusually accurate recordkeeping. Moreover, the proportion of newly licensed physicians who actually enter the profession is close to 100 percent, far higher than in most occupations. The supply consists primarily of recent graduates of U.S. or foreign medical schools; only a small number of jobs are filled by licensed physicians who had previously left the civilian labor force temporarily because of military service, disability, or household responsibilities.

The newly developed data show that less than 2 percent of physicians left the occupation in 1980-81. This corroborates available information about their labor force behavior and is consistent with unpublished data on separations collected by the American Medical Association.

Estimated openings in 1980 were compared with data from the Bureau of Health Professions (BHP) on graduates of U.S. and foreign medical schools. BHP supply data for 1980 indicate an increase of about 18,000 in the total number of physicians, consisting of graduates of both U.S. and foreign medical schools. This estimate roughly coincides with the estimate of annual openings derived from CPS data.

To assess the future supply-demand relationship, projected data about physicians were examined. Openings for physicians during 1980-90 are estimated to average 17,500 annually. Since the number of U.S. and foreign medical school graduates—the only source of supply of new physicians—is expected to number 19,000-21,000, a surplus of physicians is indicated. Evidence of oversupply in some areas of the country is already evident, and supply-demand imbalances may intensify.

Registered nurses. As in the case of physicians, analysis of the supply-demand relationship for nurses begins with a review of the flow of workers into and out of the occupation during the course of a year. During 1980, approximately 130,000 job opportunities existed: 10,000 due to employment growth, 30,000 due to the need to replace nurses transferring to other occupations, and 90,000 due to the need to replace nurses who stopped working. Persons age 25-34 who left the labor force and assumed household responsibilities accounted for a significantly large group.

An initial review of supply data indicates that approximately 70,000 of the individuals who completed nursing training programs in 1980 entered the profession that year. These data indicate, therefore, that many more opportunities exist each year than are filled by new graduates of nursing schools. The newly developed data about occupational movements help put into perspective the importance of the large reserve pool of licensed but inactive nurses who comprise an additional source of supply.

Review of the CPS-based data on movements into professional nursing indicates that about 35,000 entrants had been employed in another occupation a year earlier, and 95,000 had not been working. The data also indicate that 45,000 persons age 25 or older had been out of the labor force a year earlier due to household responsibilities. This latter group probably does not include many recent graduates. Thus the picture emerges that nurses generally do not discard their training by transferring to employment in other occupations but do temporarily leave jobs because of family responsibilities and, when convenient, return to the profession.

Projected data for 1980-90 indicate that the total number of job openings for nurses is expected to increase while no increase in the number of nursing graduates is anticipated. With no increase in the output of nursing schools, new nursing graduates would constitute only 40 percent of the required supply compared to an estimated 50 percent in 1980. It can be concluded, therefore, that opportunities for new graduates will probably be better because (1) more opportunities should exist and (2) employers generally prefer new graduates because their training is more recent and their salary requirements are usually lower than for experienced nurses. Similarly, opportunities for trained nurses not presently employed would, on the average, be better

because of the increased number of opportunities. Indeed, employers may have to increase salaries in order to attract additional qualified nurses. While it is not possible to characterize the situation as a shortage, training program planners may decide to increase the number of nurses in training programs if they consider it desirable to maintain or increase the proportion new graduates comprise of total supply.

Food counter workers. This occupation, in which employees are trained on the job, provides a final example of how analysis of CPS-based data about movements into and out of an occupation can provide insights into the supply-demand relationship.

In 1980, about 220,000 job openings were filled—about 40,000 openings were due to employment growth and 180,000 to replacement needs. Replacement needs were exceptionally large for this occupation because almost 50 percent of all employees left the occupation during the year—half of them transferred to other occupations and half stopped working. Of those who stopped working, by far the largest group were persons with a high school education or less who left the labor force to attend school.

Information about persons obtaining jobs as food counter workers during 1980 indicated that only 1 person in 5 transferred from another occupation. The largest single group obtaining employment consisted of persons age 16-19 with a high school education or less. Only 15 percent of all openings were for full-time jobs.

Over the 1980-90 period, 270,000 annual job openings are projected for food counter workers—20,000 due to increased employment and 250,000 due to replacement needs. Despite the fact that all training for this occupation occurs on the job, information about the supply-demand relationship derived from the CPS data should be of interest to persons seeking information about part-time jobs, and to corporate planners. For example, young persons who had not been working are the major source of supply of new food counter workers. In the face of increased demand, employment prospects for this and other demographic groups should improve. However, the potential supply of persons age 16-19 is expected to decline through the 1980's. With demand increasing and the potential supply decreasing, employment prospects for young persons are especially good, and additional incentives such as an increase in wages may be necessary to lure a larger proportion of this age group into the labor market. This may not be possible, and corporate planners may have to consider hiring other groups of workers to fill their needs.

Chapter 2. Tomorrow's Jobs

This chapter provides an overview of expected trends in the economy and of job openings over the 1980–90 period. It also assesses the outlook for college graduates.

Population

Changes in population are among the basic factors that will affect employment opportunities in the future. The demand for workers in any occupation depends ultimately on the goods and services sought by the public. Changes in the size and characteristics of the population influence the amount and types of goods and services demanded. Changes in population also affect the size and characteristics of the labor force—the people who work or are available to work—which in turn can influence the amount of competition for jobs in an occupation. Three population factors that will affect future employment opportunities are population growth, shifts in the age structure of the population, and movement of the population within the country.

Population growth. The population of the United States has increased throughout the century. However, the rate of growth (the size of the annual increases) was declining until the post-World War II "baby boom," which lasted until the late 1950's. Since the 1960's, the rate of growth has declined again.

In 1980, the population was 226.5 million. It is expected to increase by about 0.9 percent a year during the 1980's, slightly faster than during the 1970's. Continued growth will mean more people to provide with goods and services, causing greater demand for workers in many industries. The effects of population growth on employment in various occupations will differ. These differences are accounted for in part by the age distribution of the future population.

Age structure. Because of the "baby boom," the proportion of people age 14 to 24 was high in the 1970's. Through the 1980's, as these young adults become older, the proportion of the population between the ages of 25 and 44 will swell. By 1990, nearly one-third of the population will be in this age group compared to 24 percent in 1970. As a result of the relatively low number of births during the 1960's and early 1970's, the number of people between the ages of 14 and 24 will decline in the coming decade. The number of people 65 and over will grow, but more slowly than in recent years. These changes in the age structure of the population will directly affect the types of goods and services demanded. For example, as the number of young people declines, the need for some education services will fall. When greater numbers of people from the baby boom establish families, they will require more housing and goods such as appliances.

Shifts in the age structure of the population also will affect the composition of the labor force. These effects are discussed in a later section.

Regional differences. National trends in population may not be the same as changes in a particular region or locality. A nation as large as the United States is bound to vary from one place to another in rate of population growth. For example, between 1970 and 1980, the population of the Northeast and North Central regions increased by 0.2 percent and 4.0 percent, respectively, compared with 20.0 percent in the South and 23.9 percent in the West. These differences in population growth reflect the movement of people to find new jobs, to retire, or for some other reason.

Geographic shifts in the population alter the demand for and supply of workers in local job markets. In areas with a growing population, for example, demand for services such as police and fire protection, water, and sanitation will increase. At the same time, in some occupations more people looking for work in those areas could increase competition. Individuals investigating future employment opportunities in an occupation should remember that local conditions could differ greatly from national projections. Sources of information about local job market conditions can be found in appendix E.

Labor force

The size and characteristics of the labor force determine the number and type of people competing for jobs. In addition, because workers are a vital part of the production process, the size of the labor force affects the amount of goods and services that can be produced. Growth, alterations in the age structure, and rising educational levels are among the labor force changes that will affect employment opportunities through the 1980's.

Growth. The civilian labor force consists of people with jobs and people looking for jobs. Through the late 1960's and the 1970's, the number of people in the labor force

grew tremendously because many people born during the baby boom entered the job market, and women increasingly sought jobs. In 1980, the civilian labor force totaled about 105 million persons—63 percent of the noninstitutional population 16 years of age and over.

The labor force will continue to grow during the 1980's but at a slower rate than in recent years. By 1990, the size of the labor force is expected to range from 122 to 128 million persons—a projected increase of 17 to 22 percent over the 1980 level. Contributing to this anticipated growth will be the expansion of the working age population and the continued rise in the proportion of women who work. The labor force will grow more slowly between 1985 and 1990 than in the early 1980's. This slowdown will result from a drop in the number of young people of working age despite continued growth in the participation rate of women. A larger labor force will mean more people looking for jobs. However, because of shifts in the age structure, the employment outlook for many individuals will improve.

Age structure. As a result of the baby boom, a large number of young people entered the labor force during the 1970's, increasing competition for many entry level jobs. As the number of people between 16 and 24 drops, there will be fewer first-time entrants into the labor force, and competition for entry level jobs should ease. The proportion of 25- to 54-year-olds in the labor force will swell as people born during the baby boom get older. The whole economy should benefit from this change because workers in this age group generally have work experience and are, therefore, more productive and less likely to be unemployed.

Education. Employers always wish to hire the best qualified persons available at the offered wage. This does not mean that they always choose those applicants who have the most education. However, the higher educational attainment of the labor force as a whole could increase competition in many occupations. Many technical, craft, and office occupations now require postsecondary vocational education or apprenticeship, because employers prefer to hire trained applicants rather than provide training. Thus, high school dropouts are likely to be at a serious disadvantage when seeking jobs that offer better pay or advancement.

Traditionally, a college education has been viewed as a gateway to better pay, higher status, and more challenging work. As college education has become more widespread, the proportion of workers in the labor force who have completed at least 4 years of college has risen from 8 percent in 1952 to 19 percent in 1980. Recent experience has shown, however, that the traditional view of a college degree as a guarantee of success has not been matched by reality. Between 1970 and 1980, employment of college graduates grew 84 percent. The proportion employed in professional, technical, and managerial occupations, however, declined because these occupations did not expand rapidly enough to absorb the growing supply of graduates. As a result, 1 out of 5 college graduates who entered the labor market between 1970 and 1980 took jobs not usually considered by graduates to be appropriate to their education and abilities. The proportion of graduates in clerical, lower level sales, and blue-collar occupations grew. The outlook for college graduates is discussed in detail in a later section.

Employment growth

The previous sections discussed trends in the population and the labor force—two factors that affect employment opportunities. Other factors include the policies of the Federal Government, the rate of inflation, and the availability of energy. Changes in these and related factors affect the amount and type of goods and services that will be demanded in the future. If the demand for an industry's output increases in the future, more workers generally will be hired to increase production, and employment in the industry will grow. Growth in an occupation is closely related to the growth rates of industries in which the occupation is found. For example, growth in the construction industry would result in an increase in employment of blue-collar workers, as would growth in mining, manufacturing, or transportation—industries that also employ a high proportion of blue-collar workers. Likewise, growth in finance, insurance, and real estate would result in an increase in demand for white-collar workers.

The Bureau of Labor Statistics has prepared three sets of projections of employment in industries and occupations. Referred to as the low-trend, high-trend I, and high-trend II alternatives or scenarios, the projections are based on different assumptions concerning growth of the labor force, unemployment, output, productivity, and other factors. The low-trend projection assumes a decline in the rate of labor force growth, moderately high employment levels throughout the decade, continued high inflation, and modest increases in production and productivity. The two high-trend scenarios are more optimistic, assuming a slowdown of inflation and lower unemployment rates than the low-trend scenario. The high-trend I scenario assumes a faster growth of the labor force but slower growth of productivity than the high-trend II scenario. A more detailed discussion of the assumptions and methods used to develop the three sets of projections can be found in appendix A.

Growth in industries. Over two-thirds of the Nation's workers currently are employed in service-producing industries—transportation, communications, and public utilities; finance, insurance, and real estate; wholesale and retail trade; services; and government. Goods-producing

industries—agriculture, mining, construction, and manufacturing—employ less than one-third of the country's work force. Service-producing industries are projected to employ an even greater proportion of the work force through the 1980's.[4]

Among the specific sectors, services will continue to grow fastest and will provide the most new jobs. Gains are expected to be greatest in the industries that provide health care services—hospitals, nursing homes, medical laboratories, therapists' offices, nurses' services, and doctors' and dentists' offices. Auto repair firms and establishments that provide a variety of business and professional services such as personnel supply and computer and data processing also should experience faster than average rates of growth.

Trade, currently the largest industry sector, will rank second in new job formation. Wholesale trade is projected to grow about as fast as the average for all industries; eating and drinking establishments are expected to experience faster than average employment gains.

Manufacturing employment grew relatively slowly in the 1970's but a faster rate of growth is expected during the 1980's, primarily because of anticipated strong demand for durable goods such as computers and peripheral equipment as well as other high-technology items, including optical equipment, typewriters and other office equipment, radio and communication equipment, and scientific and controlling instruments. In nondurable goods industries, falling demand or rapid productivity growth are likely to dampen employment growth.

Public sector growth will slow, reflecting, in large part, a projected decline in education expenditures.

Growth in occupations. Growth rates among the major occupational groups have differed markedly since 1960. White-collar workers now represent about half of the total labor force, up from 43 percent in 1960. The number of service workers also has risen rapidly, while the blue-collar work force has grown only slowly and farm workers have declined. The following section describes expected changes among the broad occupational groups between 1980 and 1990. Appendix C provides information by detailed occupation.

Professional and technical workers include many highly trained workers such as scientists and engineers, medical practitioners, teachers, entertainers, pilots, and accountants. Between 1980 and 1990, employment is expected to grow from 16.4 million to between 19.7 and 20.7 million workers, or by 20 to 26 percent. Greater efforts in energy development and industrial production will contribute to a growing demand for scientists, engineers, and technicians. The medical professions can be expected to grow as the health services industry expands. The demand for systems analysts and programmers to further develop and utilize computer resources is projected to grow rapidly. Some occupations in this group will offer less favorable job prospects. For example, employment of secondary and college and university faculty is expected to decrease somewhat as a result of declining school enrollments. Other jobs, such as lawyer or architect, are expected to grow substantially but will be very competitive because they attract many applicants.

Managers and administrators include workers such as bank officers and managers, buyers, credit managers, and self-employed business operators. Between 1980 and 1990, this group is expected to grow from 9.4 million to between 10.6 and 11.3 million, or by 13 to 21 percent. Changes in business size and organizational structure have resulted in differing trends for self-employed and salaried managers. The number of self-employed business managers will continue to decline as large corporations and chain operations increasingly dominate many areas of business. Some small businesses, such as quick-service groceries and fast-food restaurants, still will provide opportunities for self-employment, however. The demand for salaried managers will continue to grow as firms increasingly depend on trained management specialists, particularly in highly technical areas of operation.

Clerical workers constitute the largest occupational group and include bank tellers, bookkeepers and accounting clerks, cashiers, secretaries, and typists. Between 1980 and 1990, employment in these occupations is expected to grow from 18.9 million to between 22.4 and 23.9 million workers, or by 19 to 27 percent. Although new developments in computers, office machines, and dictating equipment will enable clerical workers to do more work in less time and will change the skills needed in some jobs, continued growth in employment is expected in most clerical occupations. Exceptions are keypunch operators, stenographers, and airline reservation and ticket agents—occupations in which employment is expected to decline or change very little as improved technology reduces the need for workers. Conversely, the more extensive use of computers will greatly increase the employment of computer and peripheral equipment operators.

Sales workers are employed primarily by retail stores, manufacturing and wholesale firms, insurance companies, and real estate agencies. Employment in this group is expected to grow from 6.8 million to between 8.1 and 8.8 million workers, or by 19 to 28 percent. Much of this growth will be due to expansion in the retail trade industry, which employs nearly one-half of these workers. The demand for both full- and part-time sales workers in retail trade is expected to increase as a growing population and changes in its geographic distribution require new shopping centers and stores. Despite the use of laborsaving merchandising techniques such as computerized checkout counters,

[4] For a detailed discussion of employment trends and projections in industries, see *Economic Projections to 1990*, BLS Bulletin 2121, March 1982.

more stores and longer operating hours will cause employment to increase.

Craft workers include a wide variety of highly skilled workers, such as carpenters, tool-and-die makers, instrument makers, all-round machinists, electricians, and automobile mechanics. Between 1980 and 1990, employment in this group is expected to increase from 12.4 million to between 14.6 and 15.8 million, or by 18 to 27 percent. Employment in many craft occupations is tied to trends in a particular industry. Employment in nearly all construction trades, for example, is expected to grow because of high demand for residential construction and business investment in new plants. In contrast, the long-run employment decline in the railroad industry will lessen the demand for some craft occupations concentrated in that industry, such as railroad and car shop repairers. Because of advances in printing technology, very little growth is anticipated in the printing crafts.

Operatives, except transport, include production workers such as assemblers, production painters, and welders. Between 1980 and 1990, employment is expected to rise from 10.7 million to between 12.2 and 13.2 million workers, or by 14 to 23 percent. Employment of operatives is tied closely to the production of goods, because the majority of these workers are employed in manufacturing industries. The projected slow growth of some manufacturing industries, along with improved production processes, will hold down the demand for many of these workers. Employment of textile operatives, for example, is expected to decline as more machinery is used in the textile industry.

Transport operatives include workers who drive buses, trucks, taxis, and forklifts, as well as parking attendants and sailors. Employment in most of these occupations will increase because of greater use of most types of transportation equipment. Some occupations, such as bus driver and sailor, will grow only slowly. Between 1980 and 1990, employment of transport operatives is expected to rise from 3.5 million to between 4.2 and 4.4 million workers, or by 18 to 26 percent.

Laborers include such workers as garbage collectors, construction laborers, and freight and stock handlers. Employment in this group is expected to grow slowly as machinery increasingly replaces manual labor. Power-driven equipment, such as forklift trucks, cranes, and hoists will handle more material in factories, loading docks, and warehouses. Other machines will do excavating, ditch digging, and similar work. Between 1980 and 1990, employment of laborers is expected to increase from 5.9 million to between 6.7 and 7.1 million workers or by 14 to 22 percent.

Private household service workers include housekeepers, child care workers, and maids and servants. In contrast to the rapid employment growth expected for other service occupations, the number of private household workers is projected to remain about the same as in 1980 when employment was 988,000. Although demand for maids and other private household workers should rise as more women work outside the home and personal incomes rise, fewer people are expected to seek these jobs because of the low wages, lack of advancement opportunities, and low social status associated with the work.

Service workers include a wide range of workers—firefighters, janitors, cosmetologists, and bartenders are a few examples. These workers, most of whom are employed in service-producing industries, make up the fastest growing occupational group. Factors expected to increase the need for these workers are the rising demand for health services as the population becomes older and—as incomes rise—more frequent use of restaurants, beauty salons, and leisure services. Between 1980 and 1990, employment of service workers is expected to increase by about 24 to 32 percent, from 14.6 million to between 18.1 and 19.2 million workers.

Farm workers include farmers and farm managers as well as farm laborers. Employment of these workers has declined for decades as farm productivity has increased as a result of fewer but larger farms, the use of more efficient machinery, and the development of new feeds, fertilizers, and pesticides. Between 1980 and 1990, the number of farm workers is expected to decline from 2.7 million to between 2.4 and 2.2 million workers, or by between 10 and 18 percent.

Total job openings

The total number of job openings expected in future years is the sum of openings resulting from employment growth and those arising from replacement needs (table 3). As discussed in chapter 1, the Bureau's earlier estimates of replacement needs, which accounted for roughly 2 out of 3 openings, included only openings due to deaths and retirements. These estimates understated replacement needs because they excluded openings that are created as workers leave the labor force temporarily to return to school and for other personal reasons. They also excluded openings created as workers change occupations. After several years of research, the Bureau has developed estimates that take account of these factors.

Under this expanded definition, the Bureau estimates that replacement needs account for about 9 out of 10 job openings. Thus, it is apparent that even occupations in which employment is expected to increase slowly or decline—laborers and private household service workers, for example—offer many job opportunities. (For a comparison of estimates of replacement needs under the old and new methods, see table 2, chapter 1.)

Replacement needs vary among occupations. These variations reflect differences in the average age of workers in the occupation, the earnings and status associated with the job, and the level of required training. Retail trade sales workers, for example, leave their jobs more readily than physicians do, and more easily find a similar or better occupation. Physicians have few occupations of equal status and

Table 3. Projected average annual job openings, based on low-trend and high-trend I alternative projections,[1] by major occupational group, 1980-90

(In thousands)

Occupational group	Total openings		Employment change		Replacement needs	
	Low	High	Low	High	Low	High
Total, all occupations	23,248	24,884	1,748	2,580	21,500	22,304
Professional and technical workers	2,337	2,503	327	433	2,010	2,070
Managers and administrators	1,272	1,395	121	199	1,151	1,196
Clerical workers	4,810	5,121	355	505	4,454	4,616
Sales workers	1,872	2,013	129	194	1,743	1,819
Craft workers	2,124	2,327	220	339	1,904	1,988
Operatives, except transport	2,527	2,734	147	249	2,380	2,486
Transport operatives	715	766	63	90	653	676
Laborers	1,985	2,105	81	128	1,904	1,977
Private household service workers	390	393	(−1)	0	390	393
Service workers, except private household	4,842	5,107	356	468	4,486	4,639
Farmers and farm managers	124	129	(−25)	(−13)	124	129
Farm supervisors and laborers	300	316	(−24)	(−13)	300	316

[1] See appendix A for explanation of alternative projections.

NOTE: When employment is projected to decline, openings arise only from replacement needs.

pay to which they could transfer. They also have invested a great deal of time and money in preparing for their careers. As a result, the replacement rate is much higher for retail trade sales workers than for physicians.

Outlook for college graduates

Growth in the demand for college graduates is primarily the result of growth of those occupations that require a substantial proportion of workers with college degrees, such as professional and technical occupations. In addition, many college graduates enter such occupations each year to replace workers who retire or leave the labor force to return to school or take on family responsibilities.

Educational upgrading is another source of growth in demand for college graduates. This occurs when the amount of education required to enter an occupation increases over time as the work and the skills required to perform it become more complex and employers begin to seek college graduates to fill jobs not requiring a degree in the past. During the 1970's, most of the educational upgrading occurred in managerial and nonretail sales jobs.

Not all educational upgrading reflects changes in skill requirements, however. It may also simply reflect the tendency of employers to hire the most qualified people available. As the number of available graduates increases, employers raise their hiring standards and are still able to hire all the workers they need. At the same time, graduates faced with a tighter job market may lower their standards for what they consider appropriate employment.

The demand for college graduates in the 1980's was projected by analyzing trends in both occupational employment and educational upgrading within occupations. Alternative low and high projections of total occupational employment were developed as part of BLS's projections program, as explained in appendix A.

Based on trends in the proportion of workers with 4 or more years of college in the major occupational groups, ratios were projected reflecting the proportion of jobs in each group that could be expected to require a college degree. Projected requirements for college graduates were obtained by applying these projected ratios to the projections of total occupational employment (table 4).

During the 1970's, employment in professional and technical, managerial, and nonretail sales jobs—occupations generally requiring substantial proportions of workers with a degree—increased 40 percent, compared to about 28 percent growth for all workers. Between 1980 and 1990, employment in these occupations is projected to grow more slowly. They are expected to increase between 18 and 25 percent, depending on varying assumptions about growth in the economy, about as fast as the average for all occupations in the 1980's.

Educational upgrading was projected to occur in professional and technical, managerial and administrative, and nonretail sales occupations, continuing the trend toward greater complexity and skill requirements of many of these jobs, as well as employers' responses to a greater supply. A constant, but small, proportion of the jobs in other occupations were projected to require a college degree.

Table 4. Percent of workers in selected occupational categories with 4 years of college or more, selected years 1959-80 and projected 1990 requirements

Occupational group	Actual					Projected
	1959	1965	1970	1975	1980	1990
All occupations	10.0	12.0	13.2	16.8	19.1	16.9
Professional and technical workers	56.1	58.8	59.8	63.8	64.0	69.3
Managers and administrators, except farm	13.1	17.7	20.1	28.7	33.4	42.0
Nonretail sales workers	18.8	20.3	24.1	31.1	34.1	41.0
Other occupations	2.1	2.3	2.2	4.1	5.6	.9

College graduates entering the labor force during the 1980's are expected to encounter job market conditions very similar to those faced by entrants of the 1970's. About 15 million college graduates are projected to enter the labor force—about 60 percent are expected to be new graduates. Most of the remainder are expected to be re-entrants—college-educated workers who left the labor force to raise a family, to pursue graduate education, or for other reasons.

Depending on the amount of economic growth realized by the economy as a whole and employment growth in college-graduate-dominated occupations in particular, between 12 and 13 million graduates are projected to be required during the 1980's.

About 67 percent of the graduates are expected to be required in professional and technical occupations and 28 percent in managerial, administrative, and sales occupations. The majority will be needed to replace college graduates who are expected to retire or leave the labor force for other reasons over the period.

A surplus of between 2 and 3 million college graduates is expected to enter the labor force during the 1980's. If the economy grows as slowly as it did during the 1970's, the surplus would be the higher figure, an average annual surplus of about 300,000 college graduates—about 1 graduate in 5, just as in the 1970's. If the economy grows more rapidly than it did in the 1970's, the average surplus would be about 200,000 college graduates—about 1 in 7—each year.

Even with more rapid growth, however, the job market experienced by college graduates in the 1980's is unlikely to be more favorable than in the 1970's. In 1980, a surplus of college graduates estimated at 3.8 million was already in the labor force, either employed in jobs that did not require their level of education or unemployed. Of course, many of these have since begun satisfying careers in occupations that do not require 4 years of college education. Others, however, can be expected to compete for jobs that more fully utilize their education. The job market will be more competitive to the extent that this pool of underemployed 1970's entrants competes along with 1980's entrants for job openings requiring a college degree.

Like college graduates in the 1970's, future college graduates cannot be assured that they will find jobs in the occupations of their choice. Many may experience periods of unemployment, have to relocate to other areas of the country, or job-hop before finding one that satisfies them. As in the 1970's, some may have to compete with non-graduates for the more desirable jobs not previously filled by graduates, but in many cases, their additional education will prove to be an advantage. Even though a college degree may not be required, many employers prefer to hire the best educated candidate who is qualified for a job. In many cases, a college graduate will also have an advantage in gaining promotion in non-college careers over those without degrees. Many graduates who are forced to start work in jobs for which they are overqualified nevertheless may gain useful experience that will be an advantage in competing later for more challenging jobs. Graduates who make a wise career choice and who are best prepared to enter the job market should make a smooth transition from school to work. Those who are not will end up scrambling for the best available jobs. Most graduates, however, will probably find a job and few should face sustained unemployment.

Chapter 3. Occupational Movements, 1980-81

This chapter provides an overview of occupational dynamics over a 1-year period—1980-81. Data are presented on the demand for new workers—the number of job openings arising from employment growth and replacement needs. The latter source of demand is examined in detail to identify the characteristics of persons leaving occupations. The characteristics of individuals who obtained employment during 1980 also are examined to identify (1) their previous employment status, (2) the occupations offering the most opportunities for individuals with different levels of education, and (3) the occupations providing the most opportunities for part-time employment.

While the discussion in this chapter is based on Current Population Survey (CPS) data, rather than the Occupational Employment Statistics (OES) survey-based data that appear in chapters 2 and 4, not all of the information comes from the same CPS survey. For example, information on opportunities due to employment change comes from CPS annual average data since these are the most accurate. However, replacement needs are estimated using information about occupational separations developed by merging matched CPS data about changes in labor force status with January 1980-81 CPS data about occupational transfers. (The methodology for and limitations of this new data base are discussed in appendix B.) Besides providing occupational replacement estimates, the merged data are used to examine occupational separations by age, sex, and several other characteristics. Finally, supply-related data come from supplemental questions asked in the January 1981 CPS. While the January 1981 CPS information on training program completions is not as accurate as that presented in appendix D, they are presented here because they are consistent with the demand data and identify differences in employment patterns for new graduates and experienced workers with the same education.

Although the 1980-81 CPS data on demand and supply do not come from the same survey, they nonetheless provide a unique glimpse of labor market dynamics over a 1-year period. However, these data only provide information about 1980-81. Additional work remains to determine how movements into, out of, and between occupations vary with economic conditions.

Job Openings

Employment opportunities for workers not previously employed in an occupation depend on changes in total employment and the need to replace employees who leave the occupation. As shown in table 5, a total of about 19 million job openings occurred during 1980.

Table 5. Job openings, 1980-81

(In thousands)

Occupational group	Annual average employment [1]		Job openings		
	1980	1981	Total	Employment change [2]	Replacement needs [3]
Total	97,270	98,313	19,386	1,043	18,343
Professional and technical workers	15,613	16,055	2,183	442	1,741
Managers and administrators, except farm	10,919	11,315	1,658	396	1,262
Sales workers	6,172	6,291	1,560	119	1,441
Clerical workers	18,105	18,187	3,989	82	3,907
Craft and kindred workers	12,529	12,397	1,574	(-132)	1,574
Nontransport operatives	10,346	10,316	2,022	(-30)	2,022
Transport equipment operatives	3,468	3,411	544	(-57)	544
Nonfarm laborers	4,456	4,469	1,487	13	1,474
Farmers and farm managers	1,485	1,477	135	(-8)	135
Farm laborers and supervisors	1,218	1,235	363	17	346
Service workers, except private household	11,917	12,136	3,490	219	3,271
Private household workers	1,041	1,024	413	(-17)	413

[1] Current Population Survey.

[2] Information about declines in employment is presented in parentheses for information only. In these cases, replacement needs are the sole source of openings. See appendix B.

[3] Calculated by applying 1980 replacement rates based on merged CPS data to 1980 CPS employment data. See appendix B for information about merged CPS data.

Table 6 lists the occupations that had 100,000 or more job openings. How these openings arose is discussed below.

Employment change

Total employment increased 1 percent during 1980 and provided 1 million new jobs (table 5). This increase was smaller than in most recent years because of unfavorable economic conditions. Professional occupations registered the greatest employment gain, followed closely by managerial occupations. Even though total employment increased, craft workers and operatives registered declines, reflecting reduced activity in the construction and manufacturing sectors. Employment of farmers and private household workers also declined, a continuation of a long-term trend.

Replacement needs

While the number of job openings created by increases in employment during 1980 was reduced by unfavorable economic conditions, replacement needs created many job opportunities and accounted for about 95 percent of all openings. Replacement needs were greatest for clerical workers, the largest major occupational group (table 5).

Replacement needs occur when employed individuals transfer to other occupations or stop working. Table 7 indicates that 1 out of every 5 employed persons left his or her occupation during 1980. Of these, 45 percent transferred to another occupation; 17 percent became unemployed; and 38 percent left the labor force.[5]

Occupational patterns. Separation rates varied significantly among the major occupational groups (table 7). Professional workers and managers had the lowest total separation rates while private household workers had the highest. Workers in occupations that generally require the most education and training and have a high proportion of men who work full time—professional occupations such as physicians, dentists, lawyers, and engineers—had both very low labor force separation rates and very low transfer rates. Occupations that require relatively little education or training—such as garage workers, gas station attendants, gardeners, cashiers, cooks, and waiters and waitresses—generally had both high labor force separation rates and high transfer rates.

[5] It may seem inappropriate to include movements into unemployment as a source of replacement needs since individuals who leave an occupation and become unemployed are not replaced. However, even though a job is not created when a person becomes unemployed, openings due to movement into unemployment nonetheless are a component of employment growth not captured by changes in employment levels. This concept is discussed in more detail in appendix B.

Table 6. Ranking of occupations by job openings, January 1980-81

Occupation [1]	Job openings		Occupation [1]	Job openings	
	Number	Percent of total		Number	Percent of total
Sales clerks, retail trade	757,750	4.0	Blue collar worker supervisors, nec	167,243	.9
Managers and administrators, nec	711,793	3.8	Bank tellers	163,231	.9
Cashiers	617,973	3.3	Restaurant, cafe, and bar managers	161,777	.9
Secretaries, nec	599,216	3.2	Guards	157,362	.8
Waiters and waitresses	465,628	2.5	Packers and wrappers, except meat and produce	149,433	.8
Cooks, except private household	437,341	2.3	File clerks	145,437	.8
Stockhandlers	358,393	1.9	Garage workers and gas station attendants	142,064	.8
Janitors and sextons	333,309	1.8	Dining room attendants	141,796	.8
Bookkeepers	304,789	1.6	Accountants	140,108	.7
Miscellaneous clerical workers	299,940	1.6			
Nursing aides and orderlies	284,332	1.5	Registered nurses	137,545	.7
Child care workers, private household	277,525	1.5	Stock clerks, storekeepers	136,765	.7
Building interior cleaners, nec	259,526	1.4	Heavy equipment mechanics, including diesel	129,989	.7
Typists	250,276	1.3	Sales representive, wholesale trade	129,663	.7
Truck drivers	245,377	1.3			
Machine operatives, miscellaneous specified	239,385	1.3	Elementary school teachers	129,295	.7
Assemblers	238,317	1.3	Sewers and stitchers	123,925	.7
Construction laborers, except carpenter helpers	232,273	1.2	Checkers and examiners, except manufacturing	122,685	.7
Carpenters	223,865	1.2	Dishwashers	122,598	.7
Farm laborers, wage workers	220,697	1.2	Secondary school teachers	121,968	.7
Freight, material handlers	215,773	1.1	Not specified clerical workers	120,725	.6
Miscellaneous operatives	202,306	1.1	Gardeners and groundskeepers, except farm	112,516	.6
Child care workers, except private household	196,016	1.0	Delivery and route drivers	112,433	.6
Receptionists	194,134	1.0	Computer, peripheral equipment operators	107,990	.6
Food service workers nec, except private household	191,982	1.0	Estimators and investigators, nec	107,586	.6
Food counter, fountain workers	177,340	.9	Counter clerks, except food	106,382	.6
Automobile mechanics	173,840	.9	Welders and flame cutters	102,409	.5
			Sales workers, retail trade, except clerks	100,042	.5

[1] 1970 Census of Population 3-digit occupational title.
nec = not elsewhere classified.
SOURCE: Current Population Survey.

Table 7. Occupational separation rates, 1980-81

(Percent)

Occupational group	Employed, 1980	Occupational separation rates, 1980-81				
		Total	Occupational transfers	Not working		
				Total	Unemployed	Not in the labor force
Total	100.0	20.0	8.9	11.1	3.4	7.7
Professional and technical workers	100.0	11.2	5.2	6.0	1.2	4.8
Managers and administrators, except farm	100.0	11.6	5.9	5.7	1.5	4.1
Sales workers	100.0	23.4	11.0	12.4	2.6	9.8
Clerical workers	100.0	21.6	10.5	11.1	2.4	8.7
Craft and kindred workers	100.0	16.0	7.2	8.9	4.3	4.5
Nontransport operatives	100.0	24.0	9.7	14.4	7.1	7.3
Transport equipment operatives	100.0	19.4	9.2	10.3	5.2	5.1
Nonfarm laborers	100.0	33.1	13.8	19.3	8.2	11.1
Farmers and farm managers	100.0	12.4	2.1	10.2	.4	9.9
Farm laborers and supervisors	100.0	28.4	7.5	20.9	3.5	17.4
Service workers, except private household	100.0	27.5	10.7	16.8	3.9	12.8
Private household workers	100.0	39.6	3.0	36.7	4.1	32.6

SOURCE: Merged data. See appendix B.

However, in some occupational groups, there were significant differences between the rates of labor force separation and transfer. For example, although private household workers were the most likely among the occupational groups to leave the labor force, they were among the least likely to transfer to another occupation. Similarly, nonfarm laborers were the most likely to become unemployed but not the most likely to leave the labor force. Many laborers are hired for seasonal or short-term jobs that last only a few weeks or months. When the job ends, individuals seek other employment but incur delays in finding it.

Occupations that have a large proportion of women frequently have low transfer rates and high labor separation rates. For example, relatively few registered nurses transferred to other occupations during 1980; they tended to leave the labor force altogether rather than change occupations.

Age and sex. The total separation rate in 1980 for both men and women declined through the 45-54 age group and then increased (table 8). However, the transfer rate declined continuously, from 22 percent for the youngest men to 1 percent for the oldest. Transfer rates were about the same for men and women within each age group.

Younger workers are more likely to shop for a job that they consider more rewarding. In addition, many younger workers take jobs in occupations temporarily as a way to advance to better paying occupations. Conversely, older workers are more inhibited in changing occupations because of factors such as seniority, restrictive hiring plans, and personal investment in experience, training, and capital.

The proportion of persons who became unemployed declined consistently with age for both men and women.

Although labor force separation rates were higher for women than for men in every age group, a U-shaped pattern was evident for both sexes—a high rate for young workers, lower rates for workers in the middle age groups, and rising rates as workers approach retirement age.

The U-shaped pattern is much more exaggerated for men than for women. Persons age 16-24 and 55 or older accounted for over 80 percent of all male labor force separations compared with only 50 percent of all female labor force separations. This difference in the pattern occurs because men are much less likely than women to leave the labor force during their prime working ages.

Education. Individuals with greater investment in education and training would be expected to have lower occupational separation rates than workers with less education or training. The data in table 9 show that occupational separation rates did decline with increased education. However, transfer rates were only slightly lower for college graduates than for persons with a high school education or less. The proportion of persons becoming unemployed, on the other hand, declined steadily with increased education. College graduates had a rate less than one-third that for persons with a high school education or less. Labor force separations also declined steadily with education, from 9 to 4 percent.

At all levels of education, men had lower labor force separation rates than women—reflecting the weaker attachment of women to the labor force because of household responsibilities. Transfer rates, however, were remarkably similar for men and women.

Full- or part-time status. Persons employed part time generally have a weaker attachment to their occupa-

Table 8. Occupational separation rates by age and sex, 1980-81

(Percent)

Age and sex	Employed, 1980	Occupational separation rates, 1980-81							
		Total	Occupational transfers	Not working					
				Total	Unemployed	Not in the labor force			
						Total	Household responsibilities	Going to school	Other, including retired
All employed persons:									
Total	100.0	20.0	8.9	11.1	3.4	7.7	3.3	1.5	2.9
Male	100.0	17.3	8.5	8.7	3.7	5.1	.1	1.3	3.7
Female	100.0	23.7	9.4	14.3	3.0	11.3	7.8	1.7	1.8
Age 16-19:									
Total	100.0	48.3	22.2	26.1	8.0	18.1	1.2	13.1	3.8
Male	100.0	47.7	22.0	25.8	9.2	16.6	.1	12.4	4.1
Female	100.0	48.9	22.5	26.5	6.6	19.9	2.6	13.9	3.4
Age 20-24:									
Total	100.0	32.1	17.0	15.1	6.2	8.9	3.8	3.2	1.95
Male	100.0	30.1	17.3	12.8	7.3	5.5	.1	3.2	2.2
Female	100.0	34.3	16.5	17.8	4.8	13.0	8.1	3.3	1.6
Age 25-29:									
Total	100.0	21.0	10.9	10.0	4.2	5.8	4.2	.6	1.0
Male	100.0	17.3	10.9	6.5	4.8	1.7	.1	.6	1.0
Female	100.0	25.8	11.0	14.8	3.3	11.4	9.7	.7	1.0
Age 30-34:									
Total	100.0	16.4	9.0	7.4	3.0	4.5	3.4	.2	.9
Male	100.0	12.8	8.7	4.2	3.1	1.0	.0	.1	.9
Female	100.0	21.6	9.4	12.2	2.7	9.5	8.2	.4	.9
Age 35-44:									
Total	100.0	12.8	6.3	6.5	2.5	4.0	2.9	.2	.9
Male	100.0	9.8	6.0	3.8	2.6	1.2	.1	.1	1.0
Female	100.0	16.1	6.0	10.1	2.3	7.8	6.7	.3	.8
Age 45-54:									
Total	100.0	10.6	3.9	6.7	2.3	4.4	2.7	.1	1.7
Male	100.0	7.9	3.5	4.5	2.5	2.0	.1	.0	1.9
Female	100.0	14.4	4.4	10.0	2.1	7.9	6.5	.1	1.3
Age 55-64:									
Total	100.0	15.0	2.3	12.7	1.8	10.9	3.7	.0	7.2
Male	100.0	14.0	2.5	11.6	2.0	9.6	.1	.0	9.4
Female	100.0	16.6	2.0	14.6	1.6	13.0	9.3	.0	3.7
Age 65 and over:									
Total	100.0	29.1	1.1	28.0	1.0	27.0	7.4	.0	19.5
Male	100.0	28.2	.9	27.4	1.0	26.4	.3	.0	26.0
Female	100.0	30.6	1.4	29.2	1.2	28.0	19.5	.0	8.5

SOURCE: Merged data. See appendix B.

tion than full-time workers. While no data on transfers are available separately for full-time and part-time workers, table 10 shows that part-time workers were slightly more likely to become unemployed than full-time workers.

A striking feature of the data is the tremendous difference in the labor force separation rates between part-time and full-time employees—21 percent for part-time employees compared with 5 percent for full-time employees. Much of this difference may be explained by the fact that younger workers, who have a weak attachment to the labor force, constitute a disproportionately large proportion of the part-time work force. Many younger workers take part-time jobs on a temporary basis and then leave the labor force to further their education or training.

Cyclical patterns. The occupational movements discussed above reflect the economic conditions prevailing in 1980-81, a period of relatively slow growth. In examining similar data for 1977-78, a period of rapid growth, some differences in the patterns of movement are evident. For example, operatives and laborers are less likely to change their occupation in periods of reduced employment growth and are more likely to become unemployed. However, other workers, such as professional and sales workers, are much less affected by fluctuations in economic activity. As shown in table 11, they changed occupations or become unemployed in about the same proportions in 1980-81, when the economy slowed, as they did in 1977-78, when it was growing rapidly. While there is much to be learned about how occupational movements vary under different economic conditions, the underlying patterns of occupational transfers and labor force separations discussed in earlier sections do not appear to vary significantly when economic conditions change.

Table 9. Occupational separation rates by level of education and sex, 1980-81

(Percent)

Level of education and sex	Employed, 1980	Occupational separation rates, 1980-81							
		Total	Occupational transfers	Not working					
				Total	Unemployed	Not in the labor force			
						Total	Household responsibilities	Going to school	Other, including retired
All employed persons:									
Total	100.0	20.0	8.9	11.1	3.4	7.7	3.3	1.5	2.9
Male	100.0	17.3	8.5	8.7	3.7	5.5	.1	1.3	3.7
Female	100.0	23.7	9.4	14.3	3.0	11.3	7.8	1.7	1.8
High school graduate or less:									
Total	100.0	21.8	8.8	13.0	4.2	8.8	3.8	1.6	3.5
Male	100.0	19.5	8.6	10.9	4.7	6.2	.1	1.4	4.7
Female	100.0	24.7	9.0	15.7	3.4	12.3	8.6	1.8	2.0
Some college education:									
Total	100.0	20.8	10.8	10.0	2.8	7.2	2.8	2.2	1.2
Male	100.0	17.7	10.1	7.6	3.1	4.5	.1	1.9	2.6
Female	100.0	25.0	11.6	13.3	2.5	10.8	6.6	2.5	1.7
College graduate:									
Total	100.0	12.8	7.6	5.2	1.1	4.1	2.0	.5	1.6
Male	100.0	10.1	7.1	3.1	1.0	2.1	.0	.4	1.6
Female	100.0	17.6	8.5	9.1	1.3	7.8	5.6	.8	1.4

SOURCE: Merged data. See appendix B.

New Employees

The following overview of data from the January 1981 CPS provides supply-related information about new employees: It describes the characteristics of individuals who had been working in a different occupation or who had not been working in January 1980.

Previous work status. The previous work status of persons obtaining employment in 1980-81 differed significantly by occupation (table 12). For example, 70 percent of all new managerial employees during 1980 transferred from other occupations—indicating that previous employment was an advantage in getting a managerial job. Obtaining specialized work experience and on-the-job training is frequently a prerequisite to assuming managerial responsibilities within an organization. On the other hand, the proportion of workers who transferred into farm and service worker occupations was less than the proportion who had not been working—indicating that previous employment was not a prerequisite for employment in many of these jobs.

Education. CPS data on training possessed by new employees are limited to years of school completed. Although they do not provide information on degrees held or field of training, they provide some information of interest for vocational guidance and planning training programs.

The occupational distribution of the workers obtaining employment 1980-81 varied considerably by education level. Table 13 shows that 46 percent of all new employees during 1980 who had a college degree entered a professional or technical job compared to 3 percent of those with only a high school education or less. Most professional occupations, of course, generally require postsecondary training. Clerical and service workers, except private household workers—occupations requiring less training than professional occupations—provided 43 percent of all jobs for persons with a high school education or less. About 1 out of 5 college graduates obtaining jobs entered a clerical or service job.

Table 13 also indicates that recent college graduates exhibit a greater propensity to enter professional occupations than do all new employees having a college degree. Likewise, recent high school graduates are more apt to enter the clerical and service (except private household) occupations than all new employees having the same or less education. Both these patterns are to be expected. In the case of college graduates, individuals would be expected to begin work in an occupation for which they have acquired specialized training. Only 11 percent of recent college graduates obtained managerial or administrative jobs. The comparable proportion for all college graduates was 16 percent.

The value of work experience for persons with a high school education or less is also supported by the data. For example, the proportions of recent graduates with a high school education obtaining employment in managerial occupations was one-third that for all newly employed persons with a high school or less education. When they complete high school, individuals do not possess the skills required by managerial occupations but acquire them later.

Table 10. Occupational separation rates by full- or part-time status and sex, 1980-81

(Percent)

Full- or part-time status and sex	Employed, 1980	Occupational separation rates, 1980-81							
		Total	Occupational transfers	Not working					
				Total	Unemployed	Not in the labor force			
						Total	Household responsibilities	Going to school	Other, including retired
All employed persons:									
Total	100.0	-	-	11.1	3.4	7.7	3.3	1.5	2.9
Male	100.0	-	-	8.7	3.7	5.1	.1	1.3	3.7
Female	100.0	-	-	14.3	3.0	11.3	7.8	1.7	1.8
Full-time:									
Total	100.0	-	-	8.0	3.2	4.8	2.1	.5	2.3
Male	100.0	-	-	6.7	3.5	3.3	.1	.4	2.8
Female	100.0	-	-	10.4	2.8	7.6	5.6	.6	1.4
Part-time:									
Total	100.0	-	-	25.3	4.2	21.1	9.1	6.2	5.7
Male	100.0	-	-	26.0	5.9	22.1	.2	9.8	12.1
Female	100.0	-	-	24.0	3.4	20.6	13.2	4.6	2.8

- Data not available.

SOURCE: Merged data. See appendix B.

Table 11. Comparison of occupational separation rates in 1977-78 and 1980-81

(Percent)

Occupational group	Employed, base year	Occupational separation rates				
		Total	Occupational transfers	Not working		
				Total	Unemployed	Not in the labor force
Professional and technical workers:						
1977-78	100.0	12.3	5.8	6.5	1.2	5.3
1980-81	100.0	11.2	5.2	6.9	1.2	4.8
Managers and administrators, except farm:						
1977-78	100.0	12.1	6.3	5.8	1.2	4.6
1980-81	100.0	11.6	5.9	5.7	1.5	4.1
Sales workers:						
1977-78	100.0	23.4	11.6	11.8	2.4	9.4
1980-81	100.0	23.4	11.0	12.4	2.6	9.8
Clerical workers:						
1977-78	100.0	21.4	10.6	10.8	2.3	8.5
1980-81	100.0	21.6	10.5	11.1	2.4	8.7
Craft and kindred workers:						
1977-78	100.0	13.9	7.0	6.9	2.5	4.4
1980-81	100.0	16.0	7.2	8.9	4.3	4.5
Nontransport operatives:						
1977-78	100.0	22.7	11.8	10.9	3.9	7.0
1980-81	100.0	24.0	9.7	14.4	7.1	7.3
Transport equipment operatives:						
1977-78	100.0	18.9	11.2	7.7	2.8	5.0
1980-81	100.0	19.4	9.2	10.3	5.2	5.1
Nonfarm laborers:						
1977-78	100.0	31.8	16.4	15.4	5.5	9.9
1980-81	100.0	33.1	13.8	19.3	8.2	11.1
Farmers and farm managers:						
1977-78	100.0	13.1	3.0	10.1	.2	9.9
1980-81	100.0	12.4	2.1	10.2	.4	9.9
Farm laborers and supervisors:						
1977-78	100.0	32.9	11.4	21.5	2.8	18.7
1980-81	100.0	28.4	7.5	20.9	3.5	17.4
Service workers, except private household:						
1977-78	100.0	28.0	11.7	16.3	3.6	12.7
1980-81	100.0	27.5	10.7	16.8	3.9	12.8
Private household workers:						
1977-78	100.0	40.1	4.5	35.6	4.7	30.9
1980-81	100.0	39.6	3.0	36.7	4.1	32.6

SOURCE: Merged data. See appendix B. The same methodology was used for both periods.

Table 12. Previous employment status of persons obtaining employment, January 1980-81

(Percent)

Occupational group	Total	Previously employed in different occupation	Previously not working	Age 15
Total	100.0	44.8	48.3	6.9
Professional and technical workers	100.0	50.7	48.1	1.2
Managers and administrators, except farm	100.0	70.5	29.3	.1
Sales workers	100.0	42.7	47.6	9.7
Clerical workers	100.0	45.4	50.8	3.8
Craft and kindred workers	100.0	57.2	40.9	1.8
Nontransport operatives	100.0	47.4	49.1	3.5
Transport equipment operatives	100.0	52.1	45.2	2.7
Nonfarm laborers	100.0	41.5	44.6	13.9
Farmers and farm managers	100.0	23.3	74.5	2.3
Farm laborers and supervisors	100.0	23.5	51.2	25.3
Service workers, except private household	100.0	31.8	54.8	13.5
Private household workers	100.0	14.5	62.6	23.0

SOURCE: Current Population Survey, January 1981.

Information about occupations offering the most opportunities for high school and college graduates in 1980-81 is presented in tables 14 and 15. Table 14 lists the occupations that provided 50,000 or more openings for persons with a high school education or less. Table 15 lists those that provided 15,000 or more jobs for college graduates. Information about the education and training possessed by persons entering specific occupations is presented in chapter 4.

Hours of work. In discussing the demand for new employees, the high labor force separation rate of part-time workers was cited as a significant source of replacement needs. Table 16 shows that one-third of all persons obtaining jobs in 1980 were working part time in January 1981 although the proportion varied by major occupational group. For example, the proportions of part-time employment among new employees in the managerial, craft, and nontransport operative groups—13, 13, and 15 percent, respectively—were quite low. In contrast, the proportions for sales workers; service workers, except private household; and private household workers—48, 56, and 72 percent, respectively—were high.

As table 17 shows, part-time employment opportunities were greatest for service workers, except private household. This group accounted for 30 percent of part-time job openings but only 18 percent of all openings filled during 1980.

Occupations that employ a large number of part-time workers—such as the food service occupations—frequently require little or no training but do provide work experience that may be helpful in obtaining employment in other occupations. Table 18 lists the occupations that provided 20,000 or more part-time jobs during 1980-81. Altogether, these 63 occupations accounted for 4 out of 5 part-time job openings. The top seven on the list—retail trade sales clerk, cashier, waiter and waitress, cook, stockhandler, private household child care worker, and janitor—alone provided one-third of all part-time openings.

Table 13. Persons obtaining employment by level of education, 1980-81

(Percent)

Occupational group	Total	High school graduate or less		College graduate	
		Total	Completed training in 1980	Total	Completed training in 1980
Total	100.0	100.0	100.0	100.0	100.0
Professional and technical workers	11.5	3.3	3.1	46.5	60.2
Managers and administrators, except farm	7.4	5.1	1.7	15.5	10.6
Sales workers	7.8	7.0	6.5	9.1	6.1
Clerical workers	21.7	21.4	29.5	14.5	11.2
Craft and kindred workers	8.9	10.1	8.6	3.4	1.8
Nontransport operatives	11.9	14.5	13.9	2.8	1.9
Transport equipment operatives	2.8	3.4	2.9	.8	.4
Nonfarm laborers	6.9	8.6	8.6	1.4	1.2
Farmers and farm managers	.4	.5	.2	.3	.2
Farm laborers and supervisors	1.4	1.8	1.1	.2	.0
Service workers, except private household	18.2	21.7	22.5	5.2	6.5
Private household workers	2.0	2.6	1.6	.3	.0

SOURCE: Current Population Survey, January 1981.

Table 14. Ranking of occupations by job openings for persons with a high school education or less, January 1980-81

Occupation [1]	Job openings	
	Number	Percent who graduated in 1980
Sales clerks, retail trade	541,781	9.9
Cashiers	520,607	14.5
Secretaries, nec	383,843	10.0
Cooks, except private household	370,684	9.1
Waiters and waitresses	356,982	4.2
Managers and administrators, nec	338,258	2.2
Stockhandlers	309,645	8.4
Janitors and sextons	283,712	8.5
Child care workers, private household	242,045	5.6
Building interior cleaners, nec	228,960	4.6
Nursing aides and orderlies	224,467	9.1
Machine operatives, miscellaneous specified	209,837	10.7
Truck drivers	208,968	3.5
Assemblers	206,110	9.4
Bookkeepers	201,851	13.4
Farm laborers, wage workers	194,826	5.1
Construction laborers, except carpenter helpers	186,818	8.5
Miscellaneous clerical workers	187,340	10.8
Freight, material handlers	186,715	4.0
Miscellaneous operatives	179,290	10.0
Typists	173,660	8.6
Food service workers, nec, except private household	172,444	13.6
Carpenters	167,347	6.7
Automobile mechanics	150,971	7.2
Child care workers, except private household	150,649	6.2
Food counter and fountain workers	150,645	7.7
Packers and wrappers, except meat and produce	144,727	4.2
Garage workers and gas station attendants	127,997	11.5
Dining room attendants	125,922	11.0
Receptionists	124,042	6.6
Office machine operators	123,897	9.5
File clerks	121,804	24.7
Sewers and stitchers	116,459	2.9
Dishwashers	114,163	7.9
Restaurant, cafe, and bar managers	106,141	1.6
Blue collar worker supervisors, nec	100,170	.0
Bank tellers	100,033	10.4
Heavy equipment mechanics, including diesel	98,469	10.2
Checkers and examiners, except manufacturing	97,284	6.5
Welders and flame cutters	95,280	5.9
Guards	90,651	7.3
Stock clerks, storekeepers	89,630	7.5
Delivery and route drivers	86,398	13.5
Gardeners and groundskeepers, except farm	79,788	8.7
Hairdressers and cosmetologists	76,839	13.0
Nonfarm laborers, not specified	76,138	14.1
Shipping and receiving clerks	72,446	8.7
Servants, private household	71,905	2.3
Painters, construction and maintenance	70,549	11.0
Mine operatives, nec	68,534	9.1
Not specified clerical workers	66,529	3.4
Counter clerks, except food	66,280	6.2
Computer, peripheral equipment operators	65,795	3.3
Health aides, except nursing	64,995	8.5
Sales workers, retail trade, except clerks	62,631	9.1
Estimators and investigators, nec	58,539	5.6
Farmers (owners and tenants)	55,712	3.4
Electricians	54,390	13.1
Telephone operators	54,250	13.3
Bartenders	54,124	3.3
Teacher aides, except monitors	53,685	3.8
Newspaper carriers and vendors	53,230	1.3
Lodging cleaners, except private household	52,402	11.5
Warehouse laborers, nec	52,185	7.7
Statistical clerks	51,704	5.1
Cutting operatives, nec	51,207	3.1
Excavating machine operators, except bulldozer	50,753	.0
Vehicle washers, equipment cleaners	50,082	10.9

[1] 1970 Census of Population 3-digit occupational title.
nec = not elsewhere classified.
SOURCE: Current Population Survey.

Table 15. Ranking of occupation by job openings for college graduates, January 1980-81

Occupation [1]	Job openings	
	Number	Percent who graduated in 1980
Managers and administrators, nec	200,123	15.7
Secondary school teachers	110,116	46.5
Elementary school teachers	109,268	29.2
Accountants	74,586	49.2
Sales representives, wholesale trade	54,439	9.8
Sales clerks, retail trade	46,540	18.1
Bank, financial managers	45,463	27.8
Registered nurses	45,299	40.3
Secretaries, nec	45,112	9.1
Social workers	41,806	28.2
Lawyers	40,899	45.4
Miscellaneous clerical workers	40,641	17.4
Therapists	35,820	51.6
Research workers, not specified	34,068	21.3
Personnel, labor relations workers	32,988	29.8
Officials and administrators, public administration	31,867	14.0
Computer programmers	30,953	44.4
Typists	27,133	17.0
Bookkeepers	27,078	7.1
Real estate agents, brokers	26,815	10.8
Waiters and waitresses	26,171	40.7
Sales representatives, manufacturing	25,205	39.8
Physicians	24,200	65.1
Clergy	24,056	28.7
Restaurant, cafe, and bar managers	24,040	24.1
Preschool, kindergarten teachers	23,865	15.8
Electrical engineers	23,089	59.0
Editors and reporters	22,628	14.3
Industrial engineers	22,286	7.9
Economists	21,612	14.4
Blue collar worker supervisors, nec	21,598	13.8
Estimators and investigators, nec	20,975	24.2
Teachers, college and university, not specified	20,632	19.3
Vocational, educational counselors	20,558	16.3
School administrators, elementary and secondary	20,099	8.3
Teacher aides, except monitors	19,801	13.9
Computer systems analysts	18,884	31.9
Teachers except college and university, nec	18,178	4.1
Receptionists	17,935	10.1
Insurance agents, brokers	17,906	9.3
Operations and systems analysts	17,833	25.6
Bank tellers	17,784	40.1
Painters and sculptors	17,308	29.7
Stock and bond sales agents	16,863	10.2
Engineers, nec	16,606	10.1
Nursing aides, orderlies	15,474	14.8
Guards	15,319	61.3
Librarians	15,292	13.9
Computer, peripheral equipment operators	15,140	12.5

[1] 1970 Census Population 3-digit occupational title.

nec = not elsewhere classified.

SOURCE: Current Population Survey.

Table 16. Persons obtaining employment by full- or part-time status and occupation, January 1980-81

(Percent)

Occupational group	Total	Full time	Part time
Total	100.0	66.2	33.8
Professional and technical workers	100.0	72.7	27.3
Managers and administrators, except farm	100.0	87.1	12.9
Sales workers	100.0	51.6	48.4
Clerical workers	100.0	64.5	35.5
Craft and kindred workers	100.0	87.4	12.6
Nontransport operatives	100.0	84.9	15.1
Transport equipment operatives	100.0	76.5	23.5
Nonfarm laborers	100.0	63.5	36.5
Farmers and farm managers	100.0	66.7	33.3
Farm laborers and supervisors	100.0	59.8	40.2
Service workers, except private household	100.0	43.9	56.1
Private household workers	100.0	28.2	71.8

SOURCE: Current Population Survey, January 1981.

Table 17. Persons obtaining full- or part-time employment by occupation, January 1980-81

(Percent)

Occupational group	Total	Full time	Part time
Total	100.0	100.0	100.0
Professional and technical workers	11.5	12.6	9.3
Managers and administrators, except farm	7.4	9.7	2.8
Sales workers	7.7	6.0	11.0
Clerical workers	21.7	21.1	22.7
Craft and kindred workers	8.9	11.8	3.3
Nontransport operatives	11.9	14.4	5.0
Transport equipment operatives	2.8	3.3	2.0
Nonfarm laborers	6.9	6.6	7.5
Farmers and farm managers	.4	.4	.4
Farm laborers and supervisors	1.4	1.2	1.6
Service workers, except private household	18.2	12.1	30.2
Private household workers	2.0	.9	4.3

SOURCE: Current Population Survey, January 1981.

Table 18. Ranking of occupations by part-time job openings, January 1980-81

Occupation [1]	Job openings		Occupation [1]	Job openings	
	Number	Percent of total		Number	Percent of total
Sales clerks, retail trade	452,514	7.1	Bank tellers	43,835	.7
Cashiers	411,287	6.4	Construction laborers, except carpenter helpers	41,223	.6
Waiters and waitresses	327,156	5.1	Hairdressers and cosmetologists	40,972	.6
Cooks, except private household	275,521	4.3	Counter clerks, except food	39,366	.6
Stockhandlers	229,927	3.6	Registered nurses	38,463	.6
Child care workers, private household	196,553	3.1	Attendants, recreation and amusement	37,390	.6
Janitors and sextons	167,574	2.6	Teachers, except college and university, nec	36,314	.6
Food counter and fountain workers	151,390	2.4	Carpenters	36,040	.6
Secretaries, nec	147,396	2.3	Miscellaneous operatives	35,560	.6
Building interior cleaners, nec	138,019	2.2	Health aides, except nursing	35,477	.6
Food service workers, nec, except private household	119,897	1.9	Library attendants, assistants	35,079	.6
Child care workers, except private household	109,608	1.7	Secondary school teachers	33,719	.5
Dining room attendants	107,296	1.7	Truck drivers	33,645	.5
Miscellaneous clerical workers	99,480	1.6	Packers and wrappers, except meat and produce	33,519	.5
Nursing aides, orderlies	96,452	1.5	Not specified clerical workers	32,387	.5
Dishwashers	95,346	1.5	Sales workers, services and construction	30,134	.5
Managers and administrators, nec	94,653	1.5	Bartenders	29,210	.5
Typists	94,184	1.5	Not specified laborers	29,040	.5
Receptionists	89,331	1.4	Real estate agents, brokers	28,769	.5
Bookkeepers	86,204	1.4	Demonstrators	27,938	.4
Farm laborers, wage workers	83,183	1.3	Machine operatives, miscellaneous specified	27,728	.4
Garage workers and gas station attendants	78,508	1.2	Preschool and kindergarten teachers	26,478	.4
Servants, private household	63,215	1.0	Delivery and route drivers	25,347	.4
Freight, material handlers	58,891	.9	Estimators and investigators, nec	25,310	.4
Teacher aides, except monitors	58,823	.9	Restaurant, cafe, and bar managers	24,344	.4
File clerks	57,156	.9	Farmers (owners and tenants)	23,824	.4
Hucksters and peddlers	56,281	.9	Sales workers, retail trade, except clerks	22,898	0.4
Elementary school teachers	55,846	.9	Athletes and kindred workers	21,396	.3
Guards	53,804	.8	Housekeepers, except private household	21,293	.3
Bus drivers	51,359	.8	Recreation workers	20,314	.3
Stock clerks, storekeepers	50,952	.8			
Newspaper carriers and vendors	50,346	.8			
Gardeners and groundskeepers, except farm	44,727	.7			

[1] 1980 Census of Population 3-digit occupational title.
SOURCE: Current Population Survey.

Chapter 4. Employment Patterns in Selected Occupations

Chapter 3 discussed occupational movements for broad categories of workers during 1980-81, based on CPS data. This chapter draws upon those data to analyze the outlook through 1990 for 55 occupations selected from those covered in the 1982-83 *Occupational Outlook Handbook*. The occupations selected represent those with 1980 employment of 50,000 or more for which Occupational Employment Statistics (OES) survey-based data and CPS employment data are definitionally consistent.

In most cases, employment data presented in this chapter were derived from the OES survey-based matrix described in appendix A and given in detail in appendix C. Sources of employment data other than the OES survey-based matrix are given in footnotes. To calculate 1980-90 average annual openings due to replacement needs, the 1980 CPS occupational replacement rates were applied to the employment level for the midpoint of the projection period. (See appendix B for a discussion of replacement rates.)

The reader is reminded that statistics on graduates or completions of various education and training programs generally represent only a fraction of the total nuumber of entrants to most occupations. Therefore, the data on completions of education programs in appendix D should not be compared with estimates of total openings in this chapter to develop estimates of shortages or surpluses. Such data should only be used in an analytical context to estimate the number of new graduates who could fill job openings.

The statements that follow are listed alphabetically and include occupations from most of the major clusters in the 1980 edition of the *Standard Occupational Classification Manual*. Each statement first discusses education and training requirements, and then discusses employment patterns indicated by data on the experience of workers in 1980. Selected training statistics from appendix D or another source are presented where appropriate. Information is presented on the job outlook through the 1980's including projected employment change and, when data permit, supply and demand. Following each analysis is a statistical summary showing 1980 estimated employment and the ranges projected for 1990 employment, percent change over the 1980-90 period, and average annual openings over this period due to growth and replacement needs.

Accountants and auditors

Training. Most large firms require applicants to have a bachelor's degree in accounting; some prefer a master's degree. A growing number of employers prefer applicants who are familiar with computers and their applications in accounting and internal auditing. Certification is extremely valuable for professional recognition. Training in accounting also is available in junior and community colleges, business schools, and correspondence schools. Job opportunities, however, for graduates of these 1- and 2-year programs usually are limited to small accounting and business firms.

Employment patterns. Job openings for accountants and auditors are projected to average between 104,000 and 115,000 a year through the 1980's as a result of relatively rapid expansion in employment and the need to replace experienced workers who leave their jobs. Employment of accountants and auditors is projected to grow faster than the average for all occupations as businesses, government agencies, and individuals increasingly rely upon the expertise of accountants to improve budgeting and accounting procedures and to make financial decisions. Nevertheless, the need to replace accountants who retire or leave their jobs for other reasons is expected to account for about 3 out of 4 openings. Still, replacement needs are a less significant source of job openings for accountants than for most occupations.

During 1980, only about 8 percent of all accountants and auditors left the occupation, compared with about 11 percent of all professional and technical workers and 20 percent of all workers. Because most accountants and auditors have invested substantial amounts of time and money in training, they are less inclined to change occupations. Of those who left the labor force, a substantial portion assumed household responsibilities or retired.

About 60 percent of the job openings for accountants in 1980 were filled by persons who had not worked the previous year. About half had been in school or

had household responsibilities; others had been unemployed. The remaining openings were filled by persons who transferred from other occupations—most likely accounting students who worked while attending school and qualified accountants who had pursued business, managerial, and other careers. Also, some bookkeepers and accounting clerks advanced to accounting and auditing positions after meeting the experience and education requirements set by their employers.

Persons with at least a college degree filled most of the job openings for accountants and auditors in 1980. Other openings were filled by graduates of junior colleges and business and correspondence schools. According to the National Center for Education Statistics, about 43,000 bachelor's and 3,500 master's degrees were awarded in accounting during academic year 1979-80. In addition, nearly 16,000 associate degrees and certificates in accounting technologies were conferred.

Employment, 1980[1]	897,000		
Projected employment, 1990	1,124,000	–	1,203,000
Percent change, 1980-90	25.3	–	34.0
Average annual openings, 1980-90	104,000	–	115,000
Growth	22,000	–	30,000
Replacement	82,000	–	85,000

[1] Includes accountants and auditors; tax examiners, collectors, and revenue agents; and an estimate for college accounting teachers based on data from the Current Population Survey.

Air-conditioning, heating, and refrigeration mechanics

Training. Most air-conditioning, heating, and refrigeration mechanics learn their skills on the job, and the type and length of training are determined by the employer. Apprenticeship programs administered by unions and air-conditioning and heating contractors are a good source of training. Apprentices receive on-the-job training in all aspects of the trade and 144 hours of classroom instruction each year in related subjects, such as the use and care of tools, safety practices, blueprint reading, and air-conditioning theory. Apprenticeships usually last 4 years, although the length varies with the skill of the apprentice. Applicants for apprenticeships must have a high school diploma and pass a mechanical aptitude test.

Many mechanics learn basic air-conditioning, heating, and refrigeration work in vocational programs at high schools, private vocational schools, and junior colleges. Although completion of such a program does not assure a job, employers may prefer to hire graduates of these programs, especially those that emphasize hands-on experience, because graduates require less on-the-job training than persons with no training.

Employment patterns. Employment of air-conditioning, heating, and refrigeration mechanics is projected to increase about as fast as the average for all occupations during the 1980's. Demand for mechanics is expected to increase as more homes and commercial and industrial buildings are constructed and as new energy-saving heating and air-conditioning systems are installed in existing homes and buildings. Job openings are projected to average between 33,000 and 36,000 a year during the 1980's due to the increased demand for these mechanics and the need to replace experienced workers who stop working or transfer to other occupations. About 9 of every 10 job openings are expected to result from replacement needs.

About three-fifths of the mechanics who left the occupation in 1980 stopped working. Of these, just over one-half became unemployed—reflecting the large proportion of mechanics in the construction industry, where brief periods of unemployment are common. The remainder left the labor force, in some cases because of a lack of work.

About two-fifths of those who left the trade in 1980 transferred to other occupations. Many probably transferred to related trades, such as plumbing and sheet-metal work.

Of the 24,000 job openings for air-conditioning, heating, and refrigeration mechanics during 1980, 85 percent were filled by workers who transferred from other occupations. Most of these entrants probably came from related occupations, such as plumber or sheet-metal worker, that provide a useful background in installation and repair. Some of those who transferred may have been experienced air-conditioning, heating, and refrigeration mechanics who had moved into other occupations during periods of slack work. Others may have been sales workers employed by distributors of air-conditioning, heating, and refrigeration equipment. A few probably were helpers being trained on the job who moved up the career ladder.

Most of the remaining 15 percent of entrants into the occupation were experienced mechanics who had been laid off or had left the labor force because of lack of work. Some entrants were recent graduates of high school or postsecondary vocational programs. A few were older mechanics, many of whom move in and out of the occupation for several years before retiring, usually working only part time.

Employment, 1980	179,000		
Projected employment, 1990	215,000	–	231,000
Percent change, 1980-90	19.7	–	28.9
Average annual openings, 1980-90	33,000	–	36,000
Growth	3,500	–	5,000
Replacement	29,500	–	31,000

All-round machinists

Training. Machinists learn their skills through training on the job. An apprenticeship program which combines

classroom and on-the-job training is the best way to acquire all-round machinist skills. Typical machinist apprenticeship programs consist of approximately 8,000 hours of on-the-job shop training over a 4-year period and about 570 hours of related classroom instruction. In the shop, apprentices train under experienced workers and learn chipping, filing, tapping, dowel fitting, riveting, and the operation of various machine tools. In the classroom, they study blueprint reading, mechanical drawing, shop mathematics, and shop practices.

A high school or vocational school education, including mathematics, physics, or machine shop training, is desirable for entry into an apprenticeship program. Some companies require experienced machinists to take additional courses in mathematics and electronics at company expense to work with newer metalworking technologies, such as numerically controlled machine tools. In addition, equipment builders generally provide training in the electrical, hydraulic, and mechanical aspects of machine-and-control systems.

Employment patterns. On average, an estimated 43,000-49,000 job openings are projected each year during the 1980's. Growth in employment is projected to be about the same as the average for all occupations. The need to replace machinists who will leave their jobs, however, is expected to account for 80-90 percent of the job openings—about the same proportion as in all craft occupations combined.

During 1980, 12 percent of all machinists left the occupation. This proportion is somewhat lower than that for all craft workers—reflecting the considerable amount of time required to learn this highly skilled occupation and the high earnings of machinists compared to those of other skilled workers. Nearly one-half of the machinists who left their jobs transferred to other occupations. Some became highly skilled instrument makers or tool-and-die makers. Of those who left the machinist trade, 30 percent left the labor force altogether. Like other craft workers, about half were retirees—age 55 and older. About one-fourth of all machinists who left the occupation in 1980 became unemployed—similar to the pattern for other craft workers.

Nearly three-fifths of all job openings for all-round machinists in 1980 were filled by persons who transferred from other occupations. These included trained machinists who previously left the occupation to do other work and persons who acquired machinist skills in their former job, such as tool-and-die makers. Also included were semiskilled machine tool operators and workers in other manual occupations who transferred into apprenticeship programs. Persons who had not worked the previous year filled over two-fifths of the openings for machinists in 1980. About half came from the ranks of the unemployed and one-fifth had been in school—a pattern very similar to that for all craft workers combined.

Persons 20-24 years old filled 45 percent of the openings for all-round machinists. In comparison, persons in this age group filled only about one-fourth of all openings in craft occupations.

Persons who had a high school education or less filled almost three-fourths of all openings for machinists in 1980. About one-fourth of the openings were filled by those with some formal postsecondary education.

Employment, 1980[1]	303,000		
Projected employment, 1990	351,000	–	390,000
Percent change, 1980-90	15.8	–	28.5
Average annual openings, 1980-90	43,000	–	49,000
Growth	5,000	–	9,000
Replacement	38,000	–	40,000

[1] Includes machinists and layout markers, metal.

Architects

Training. All States and the District of Columbia require individuals to be licensed before they may call themselves architects or contract to provide architectural services. Most people qualify for the licensing exam by obtaining at least a Bachelor of Architecture degree followed by 3 years of practical experience in an architect's office. As a substitute for formal education, most States accept additional experience in an architect's office, usually 13 years, and successful completion of a special qualifying test. Although many architecture school graduates work in the field even though they are not licensed, registered architects are required to take legal responsibility for all their work.

Graduate education is desirable for those interested in research and teaching.

Employment patterns. Employment of architects is projected to rise faster than the average for all workers during the 1980's, due to increases in new construction, especially nonresidential constrution. Job openings are projected to average between 5,500 and 6,200 a year due to the increased demand for architects and the need to replace experienced workers who stop working or transfer to other occupations. Although replacement needs are expected to account for about one-half of all job openings for architects, they should be a much less significant source of openings than in most other occupations.

Architects have a very strong attachment to the occupation, as indicated by data on the experience of workers in 1980. Only 5 percent of architects left their jobs in 1980, compared to 11 percent of all professional and technical workers and 20 percent of all workers. Of those who left their jobs, one-half left the labor force entirely. Two-thirds of these retired and the remainder

returned to school, most likely to get a graduate degree. Four of every 10 architects who left their jobs transferred to a different occupation. This represents less than 2 percent of all architects in 1980—one-third the transfer rate for all professional and technical workers—and reflects the sizable investment of time and money architects make in training. Of those who did transfer, most moved to related fields such as landscape architecture, interior design, or urban planning, where they could utilize their specialized skills. About 1 out of every 10 architects who left the occupation became unemployed, less than one-half the proportion for all professional workers.

During 1980, about 3,800 people took jobs as architects. About 86 percent had not been working, a significantly higher proportion than for other professional occupations. Most of these entrants had not been in the labor force; they were primarily recent college graduates. This reflects the relatively strict entry requirements for architects.

The remaining 14 percent of job openings in 1980 were filled by people who transferred from another occupation, one-third the rate for other professional workers. Many of these probably had been employed in another occupation while they pursued a degree in architecture. Others, who already had a degree in architecture, transferred from related occupations such as urban planner, environmental designer, or landscape architect. Some may have worked as drafters or in other occupations in an architect's office to get the required experience for the licensing examination. This route of entry into the occupation is relatively uncommon, however.

Nearly all available jobs were filled by persons under 35 years of age, a significantly larger proportion of young entrants than for other professional workers. Only about 60 percent of entrants worked full time in 1980, compared to 73 percent for other professional workers. Employment of architects is much more sensitive to swings in economic conditions than employment in most other professional occupations because demand is closely tied to the level of new construction activity. Significant downturns in building activity can temporarily reduce demand for architects, and some jobseekers may be unable to find full-time positions.

Architects are expected to face competition for jobs through the 1980's. According to the National Center for Education Statistics, about 6,900 bachelor's and master's degrees were awarded in architecture in academic year 1979-80. As the supply of graduates continues to exceed the demand for architects, more jobseekers may be forced to take jobs closely related to architecture where their skills will be utilized. In addition, rising competition is expected to make it more difficult to become an architect without a degree in architecture.

Employment, 1980	80,000		
Projected employment, 1990	106,000	-	112,000
Percent change, 1980-90	32.7	-	41.0
Average annual openings, 1980-90	5,500	-	6,300
Growth	2,600	-	3,300
Replacement	2,900	-	3,000

Assemblers

Training. Formal training requirements for assemblers are minimal. A high school diploma is helpful but usually is not required. Some employers prefer applicants who have taken vocational school courses such as machine shop. Mechanical aptitude and an ability to do routine work at a fast pace are more important than formal training for most assembly jobs. Good eyesight, with or without glasses, may be required for assemblers who work with small parts. Those who assemble electrical or electronic components with different colored wires must have good color vision.

Employment patterns. Employment of assemblers is projected to grow at least as fast as the average for all occupations throughout the 1980's as manufacturing plants respond to increased demand for consumer goods and for the industrial machinery and equipment needed in an expanding economy. Opportunities are not expected to be equally favorable throughout the economy, however, nor are they expected to be uniform throughout the period. The job outlook for assemblers will vary with the fortunes of the industries in which they are employed and, during economic downturns, they may face layoffs.

Among the largest of all occupations, assembly work provides an unusually large number of job openings. During the 1980's, openings created by replacement needs and growth in employment are projected to average between 365,000 and 400,000 a year. Most openings are expected to be due to replacement needs.

Nearly all assemblers work in manufacturing plants that produce durable goods. During economic downturns such as that of 1980, demand for durable goods declines and output is reduced. In these periods, and also when plants are shut for product changes or retooling, assemblers are laid off. About one-third of all those who left the occupation in 1980 became unemployed. Those seeking their first assembly job may therefore be competing with a large pool of experienced assemblers. In 1980, the proportion of assemblers hired from the ranks of the unemployed was twice that for all occupations.

Many assembly jobs are being lost to automation as machine or robot assembly systems are introduced on production lines for products such as washing machines and automobiles. The extent to which automation will displace assemblers—but create jobs for technicians and

repairers to build, program, and maintain the new robots—is a topic of controversy. Certainly not all assemblers can efficiently be replaced by automation. Robots are expensive and require a large volume of work to justify their purchase. They may not be economical in small operations with perhaps only one shift per day. Also, where the assembly parts involved are small or irregular in size, robot technology is only now beginning to make inroads. The effect of automation on assembler employment through the 1980's is expected to differ among manufacturing industries depending on how rapidly and extensively the technology can be adopted. Opportunities probably will vary geographically. Areas of industrial growth such as the Sunbelt States are expected to provide the best prospects.

Employment, 1980	1,670,000		
Projected employment, 1990	1,989,000	–	2,183,000
Percent change, 1980-90	19.2	–	30.9
Average annual openings, 1980-90	364,000	–	401,000
Growth	32,000	–	51,000
Replacement	332,000	–	350,000

Automobile body repairers

Training. Most automobile body repairers learn the trade on the job. They usually start as helpers and pick up skills from experienced workers. Helpers begin by assisting body repairers in tasks such as removing damaged parts and installing repaired parts. They learn to remove small dents and to make other minor repairs. They then progress to more difficult tasks such as straightening frames. Generally, 3 to 4 years of on-the-job training are needed to become skilled in all aspects of body repair. Most training authorities recommend a 3- or 4-year formal apprenticeship program as the best way to learn the trade, but relatively few of these programs are available. Apprentices spend most of their time learning on the job, but they also attend classes in related subjects such as mathematics, job safety procedures, and business management.

Employment patterns. Employment of automobile body repairers is projected to increase about as fast as the average for all occupations through the 1980's as the number of motor vehicles damaged in traffic grows. Accidents are expected to increase as the number of motor vehicles increases, although better highways, driver training courses, and improved bumpers and safety features on new vehicles may slow the rate of increase.

Job openings are projected to average between 25,000 and 27,000 a year during the 1980's due to the increased demand for automobile body repairers and the need to replace experienced workers who stop working or transfer to other occupations. Replacement needs are expected to account for about 85 percent of all openings, less than for other craft workers.

Only about 12 percent of all automobile body repairers left the occupation during 1980, a much lower proportion than for other workers. Six of every 10 workers who left the occupation became unemployed. Most of these had worked for car and truck dealerships that either went out of business or reduced the size of their service departments because of the dramatic decline in new car and truck sales during 1980. About 3 of 10 workers who left the occupation dropped out of the labor force. Relatively few transferred to other occupations.

Of those persons who took jobs as auto body repairers in 1980, three-fourths transferred from other occupations; the remainder had been unemployed or out of the labor force. About 8 percent of all entrants to the occupation were only 16 years of age. Most of these worked part time while they were in high school. In contrast, almost all job entrants over the age of 16 took full-time jobs.

Because auto body repair is learned on the job, few entrants to this occupation complete any training beyond high school. Eighty-five percent of all entrants in 1980 had a high school diploma or less education, a significantly higher proportion than for other craft workers. All those entering the occupation with postsecondary training in 1980 transferred from other occupations.

Employment, 1980	153,000		
Projected employment, 1990	189,000	–	201,000
Percent change, 1980-90	23.1	–	30.8
Average annual openings, 1980-90	25,000	–	27,000
Growth	4,000	–	5,000
Replacement	21,000	–	22,000

Automobile mechanics

Training. Most people prepare for a career as an automobile mechanic by acquiring experience in related lesser skilled occupations such as gasoline station attendant, lubrication worker, or mechanic's helper where they have the opportunity to observe and work with experienced mechanics. Many supplement this experience by taking automobile repair courses in high schools, trade and vocational schools, community and junior colleges, and the Job Corps. About 100,000 persons completed education programs in automobile mechanics from these combined sources in 1979-80. However, not all planned to become automobile mechanics. Some people pursued an interest in automobile mechanics simply as a hobby; some planned to become truck and bus mechanics, automotive body repairers, or automobile repair service estimators. Many training authorities believe apprenticeship provides the most thorough preparation for a career in automobile mechanics. However, fewer than 1,500 persons completed formal registered apprenticeship programs in automobile mechanics in 1979.

Employers generally prefer to hire high school graduates with manual dexterity, mechanical aptitude, and thorough knowledge of automotive systems. Ability to reliably perform at least the simpler automobile service and repair tasks quickly and efficiently and to understand technical repair manuals, parts catalogs, and service orders is essential. Training acquired in the Armed Forces is very useful.

Employment patterns. Job opportunities for automobile mechanics are expected to be good throughout the 1980's due to the large number of openings that will occur and the absence of rigid entry requirements. Job openings for mechanics are projected to average between 147,000 and 159,000 annually during the 1980's. Employment of mechanics is expected to increase about as fast as the average for all occupations as the number of motor vehicles in operation increases. Replacements, however, are expected to be the main source of jobs, accounting for 6 out of every 7 openings during the decade.

In 1980, 17 percent of all automobile mechanics left their jobs—roughly the same proportion as for other craft workers. Of these, 52 percent transferred to other occupations, 26 percent became unemployed, and 22 percent left the labor force. Two-fifths of the mechanics who left the labor force were persons 55 and older who presumably retired.

Nearly 6 out of 10 job openings for mechanics in 1980 were filled by persons who were not working the previous year. About 44 percent of these individuals had been unemployed—somewhat less than the proportion for all craft workers and for all mechanics and repairers. A higher than average proportion—33 percent—of those not working had been in school the year before, reflecting the attractiveness of automobile mechanic careers to younger workers, as well as the widespread availability of vocational training in this field. About 4 out of 10 entrants into the occupation in 1980 transferred from other fields of work—about the average for all occupations.

Automobile mechanic jobs generally do not require education beyond high school. Of those who entered the occupation in 1980, 87 percent had a high school education or less. Most of those who got jobs as automobile mechanics, however, did not enter directly from school. Slightly more than half of those who found work as automobile mechanics in 1980 were under 25 years of age. In comparison, less than 40 percent of all individuals entering craft jobs were under 25 years of age.

Employment, 1980	845,000		
Projected employment, 1990	1,050,000	–	1,120,000
Percent change, 1980-90	24.4	–	32.9
Average annual openings, 1980-90	146,800	–	158,800
Growth	20,600	–	27,800
Replacement	126,200	–	131,000

Bank officers and managers

Training. Bank officer and management positions are filled by management trainees, and by the promotion of outstanding bank clerks or tellers. College graduation usually is required for management trainees. A business administration major in finance or a liberal arts curriculum, including accounting, economics, commercial law, political science, and statistics, serves as excellent preparation for officer trainee positions. A Master of Business Administration (MBA) in addition to a social science bachelor's degree, which some employers prefer, may provide an even stronger educational foundation. However, the larger banks do hire people with diverse backgrounds such as chemical engineering, nuclear physics, and forestry to meet the needs of the complex, high-technology industries with which they deal. Students can gain valuable experience through summer or part-time employment programs.

Advancement of a bank clerk or teller to an officer or management position may come slowly in small banks where the number of positions is limited. In large banks that have special training programs, promotion may occur more quickly. For a senior officer position, however, an employee usually needs many years of experience. Advancement may be accelerated by special study through courses offered by local colleges and universities and the American Bankers Association.

Employment patterns. Between 55,000 and 58,000 job openings for bank officers and managers are projected annually through the 1980's due to faster than average employment growth and the need to replace experienced bank officers who transfer to other jobs or stop working. Expanded banking services and the increased dependence on computers should increase the need for bank officers and managers to provide sound management. Greater international trade and investment should create new opportunities in both international and domestic banking activities. While replacement needs are expected to account for 4 out of 5 jobs, they are a less significant source of job openings than for all managers or for all occupations combined.

Like other managers, bank officers and managers have a relatively strong attachment to their occupation. During 1980, less than 10 percent of bank officers and managers left the occupation, compared to 20 percent for all occupations. Over half of those who left transferred to other jobs—most likely to closely related positions in other areas of finance or to positions within other industries that need individuals with banking experience. Over one-quarter left the labor force altogether—mostly to retire or assume household duties.

During 1980, persons transferring from other occupations filled about two-thirds of all job openings for bank officers and managers. This pattern is similar to that for other managers but differs significantly from the average for all occupations; persons who transferred filled only 43 percent of all openings. Banks often seek individuals with banking experience—bank clerks and tellers who have demonstrated the potential for increased responsibilities, including those who worked as clerks or tellers while attending school—and persons with specialized experience in other fields. About 45 percent of those who transferred were 25-34 years old; the same proportion were college graduates.

Nearly one-third of all job openings for bank officers in 1980 were filled by persons who had not worked the previous year. About half had been in school or had household responsibilities. Over half of all bank officers who had not worked the previous year were 20-24 years old, while nearly two-thirds were college graduates.

College graduates filled half of all job openings for bank officers in 1980, compared to 29 percent for all managers and only 14 percent for all occupations. Persons with some college education filled nearly one-fifth of all bank officer jobs; those with a high school education or less filled about one-third of the openings.

Virtually all job openings for bank officers and managers in 1980 were full-time positions, compared to 87 percent of the openings for all managers and only 66 percent of the openings for all occupations.

Employment, 1980[1]	406,000		
Projected employment, 1990	513,000	–	538,000
Percent change, 1980-90	26.3	–	32.5
Average annual openings, 1980-90	55,000	–	58,000
Growth	11,000	–	13,000
Replacement	44,000	–	45,000

[1] Includes managers, officials, and proprietors employed in banking and credit agencies.

Bank tellers

Training. Bank tellers are trained on the job. Training may last from a few days to several weeks or longer. New tellers usually observe experienced workers for a few days before doing the work themselves. Beginners usually start as commercial tellers; in large banks which have a separate savings teller's "cage," they may start as savings tellers. Banks often train tellers for other clerical duties at the same time.

Employment patterns. Persons seeking bank teller positions should have good employment prospects throughout the 1980's in view of the large number of projected job openings—between 125,000 and 129,000 annually. Employment of tellers is projected to grow at a rate faster than the average for all occupations as banks expand services. Nevertheless, the need to replace experienced tellers who transfer to other jobs or stop working is expected to account for 9 out of 10 job openings—about the same proportion as for all clerical occupations combined.

During 1980, 21 percent of bank tellers left the occupation, about the same proportion as for all clerical occupations. About two-thirds transferred to other jobs. This job may serve as a stepping stone to bank officer and manager positions. Outstanding tellers who have had some college or specialized training offered by the banking industry, such as courses offered by the American Bankers Association, are particularly attractive candidates for promotion. Other tellers probably transfer to clerical positions in other industries, such as manufacturing or wholesale trade, that pay higher salaries than banks.

Over one-quarter of all bank tellers who left the occupation in 1980 stopped working altogether. Nearly three-fifths assumed household duties—almost double the proportion who left their jobs for this reason among all workers. Over 90 percent of all bank tellers are women.

During 1980, persons transferring from other occupations filled about 55 percent of all job openings for bank tellers. In comparison, persons who transferred filled about 45 percent of all job openings in clerical occupations. Some who transferred into positions as tellers probably had held other bank clerical jobs—banks encourage movement among clerical personnel.

About 45 percent of all job openings for bank tellers in 1980 were filled by persons who had not worked the previous year. About 40 percent had left household responsibilities while another 30 percent had been in school.

Persons with a high school education or less filled about three-fifths of all job openings for tellers in 1980. compared to two-thirds of the openings in all clerical occupations combined. Persons with some college education filled nearly 30 percent of the job openings, while college graduates filled only 10 percent of the jobs. Persons 16-24 years old filled nearly three-fifths of all openings for tellers, compared to less than half of the job openings in all clerical occupations.

Over one-quarter of all job openings for tellers in 1980 were part-time positions. Persons who had not worked the previous year filled more part-time jobs than those who transferred from other occupations.

Employment, 1980	480,000		
Projected employment, 1990	601,000	–	619,000
Percent change, 1980-90	25.1	–	28.9
Average annual openings, 1980-90	125,000	–	129,000
Growth	12,000	–	14,000
Replacement	113,000	–	115,000

Barbers

Training. All States require barbers to be licensed. In general, applicants must have graduated from a State-approved barber school and be at least 16 years old. Eight States require a high school diploma. Many States require beginners to obtain an apprenticeship license, and then work for 1 or 2 years before taking the written and practical examination for a license as a registered barber. Barber training programs usually last 9 to 12 months. Most are trade school programs, although some public high schools offer barbering in their vocational education programs. Because some States do not recognize out-of-State training, apprenticeship work, or licenses, persons who wish to become barbers should review the laws of the State in which they wish to work before entering barber school.

Employment patterns. Between 4,000 and 6,000 job openings are projected to arise each year during the 1980-90 period, significantly fewer than the number of openings for most occupations. Replacements for experienced barbers who stop working are expected to account for most openings. The rest will result from employment growth, which is projected to occur at a slower rate than the average for all occupations. The employment decline of the last decade, caused by the fashion for longer hair, is expected to end, and demand for barbers should be stimulated by population growth and the continued popularity of hairstyling.

Barbers have a strong attachment to their occupation, especially compared to other service workers. Once having entered the occupation, most barbers stay in it until they retire. One reason for this is that most barbers own their own shops. The high degree of occupational attachment is striking considering the educational investment—less than a year of postsecondary training.

Approximately 5,000 people completed barber school in 1980, according to the National Association of Barber Schools, and several hundred more completed registered apprenticeships. The very limited data available suggest that most graduates subsequently became licensed and entered the occupation. However, some barber school graduates were already employed as cosmetologists; operators in "unisex" salons generally find it advantageous to hold both licenses. A few barber school graduates were licensed barbers who needed formal training in order to practice in a different State (although reciprocity agreements have eliminated the need for this in many places), and some were inmates of prisons, reformatories, and other institutions.

Employment, 1980	112,000		
Projected employment, 1990	120,000	-	137,000
Percent change, 1980-90	7.3	-	22.4
Average annual openings, 1980-90	3,800	-	5,700
Growth	800	-	2,500
Replacement	3,000	-	3,200

Bookkeepers and accounting clerks

Training. High school graduates who have taken business arithmetic, bookkeeping, and principles of accounting meet the minimum requirements for most bookkeeping jobs. Many employers prefer applicants who have completed business courses at a community or junior college or business school.

Employment patterns. The job outlook for bookkeepers and accounting clerks is expected to be good throughout the 1980's due to the widespread availability of jobs, the high rate of turnover, and the relative ease of entry into this occupation.

The anticipated growth in the volume of business activity is expected to cause employment of bookkeepers and accounting clerks to grow about as fast as the average for all occupations. This growth and the need to replace employees are projected to create between 370,000 and 400,000 job openings for bookkeeping and accounting clerks annually during the 1980's. Few occupations are expected to provide more job openings. Replacement needs are expected to account for 9 out of 10 openings.

About 19 percent of all bookkeepers and accounting clerks left their jobs in 1980—about the same proportion as for all occupations, but slightly less than for all clerical workers. A larger than average proportion—52 percent—dropped out of the labor force, most to assume homemaking responsibilities. Persons who transferred to other occupations accounted for two-fifths of all those who left their jobs—less than the average for all occupations as well as for all clerical workers. Relatively few bookkeepers and accounting clerks became unemployed.

Jobs as bookkeepers and accounting clerks are predominantly held by women. The pattern of movement in the occupation is typically from work to family responsibilities and back to work again. In 1980, 54 percent of all job openings in the occupation were filled by persons who were outside the labor force the previous year. Nearly 70 percent were homemakers—a considerably higher proportion than average.

In general, those entering bookkeeping jobs were older than average. Two-thirds of all entrants in 1980 were 25 years or older, compared to only about one-half of all entrants to clerical occupations and to the work force as a whole.

Nearly 3 out of every 10 entrants into bookkeeping jobs in 1980 took part-time positions. Those coming from outside the labor force—primarily homemakers—were more likely to take part-time jobs than those transferring from other occupations. Women who

combine parental and job responsibilities probably prefer part-time work when they first return to work.

Employment, 1980	1,715,000		
Projected employment, 1990	1,975,000	-	2,123,400
Percent change, 1980-90	15.2	-	23.8
Average annual openings, 1980-90	373,000	-	401,000
Growth	26,000	-	41,000
Replacement	347,000	-	360,000

Bricklayers and stonemasons

Training. Most bricklayers and some stonemasons acquire their skills informally by working as helpers and laborers and by observing and learning from experienced workers. The remainder learn the craft through 3-year apprenticeships, which usually are sponsored by local contractors or local union-management committees, or both. In addition to on-the-job training, apprenticeship programs generally require 144 hours of classroom instruction each year in subjects such as blueprint reading, mathematics, layout work, and sketching. A high school or vocational school diploma is preferred but not required.

In 1979-80, nearly 9,500 individuals completed public or private vocational education programs in masonry occupations. Many employers prefer to hire people who have completed such programs because they impart basic skills and provide an introduction to the trade. Approximately 1,000 youths completed Job Corps training in 1979-80, and nearly 1,100 apprentices completed registered programs in bricklaying, stonemasonry, or tile setting in 1979. Another 2,000 cancelled their apprenticeship that year. Some may have left before completing the program because of an opportunity to work at the craft level. Others may have acquired enough experience to enter the occupation at another time.

Employment patterns. Employment of bricklayers and stonemasons is projected to grow faster than the average for all occupations during the 1980's, although stonemasonry may not grow quite as rapidly as brickmasonry. The volume of new construction is expected to increase because of population growth and business expansion, spurring demand for bricklayers in particular. The growing use of brick for interior load-bearing walls and for decorative work on building fronts and in lobbies and foyers is also expected to stimulate demand.

Employment growth and replacement needs are projected to provide between 38,000 and 40,000 job openings annually during the 1980's. Replacement needs are expected to account for more than 4 out of 5 openings, roughly the same proportion as that for all craft workers.

Brickmasonry and stonemasonry, like the other building trades, are highly sensitive to changes in the level of construction activity. Temporary layoffs when business is slack, and periods of not working when a project ends, are commonplace for construction workers. During economic downturns such as that of 1980, layoffs are not only frequent but extended. Three out of 4 bricklayers and stonemasons who left the occupation in 1980 became unemployed or left the labor force. The rest transferred to other occupations. Compared to all other workers, however, bricklayers and stonemasons who left the occupation in 1980 were less likely to have taken another kind of job or to have left the labor force. They were 3 times as likely to have become unemployed.

Most of the bricklayers and stonemasons who stopped working during 1980 were in their prime working years, age 25 to 54, and would be likely to reenter the occupation as soon as jobs became available. Approximately 20 percent of those who stopped working were age 55 or above. Some of those eligible for pension income might have decided to retire, but an economic upturn would probably lead others to return to work, on a part-time basis at least.

Of those who obtained bricklaying and stonemasonry jobs during 1980, 3 out of 4 had been unemployed or had worked in another occupation during the previous year. Very few jobs were available in either craft for young, inexperienced workers. People between 16 and 19 years of age filled more than 20 percent of all job openings in the economy in 1980. Individuals in that age group filled little more than 5 percent of the openings in bricklaying and stonemasonry. Because so many experienced bricklayers and stonemasons are available to start work, individuals attempting to enter these crafts for the first time are likely to encounter keen competition, at least until construction activity picks up considerably.

Employment, 1980[1]	163,000		
Projected employment, 1990	224,000	-	241,000
Percent change, 1980-90	37.5	-	47.8
Average annual openings, 1980-90	38,000	-	41,000
Growth	6,000	-	8,000
Replacement	32,000	-	33,000

[1] Includes brickmasons, refractory materials repairers, and stonemasons.

Business machine repairers

Training. The amount of formal education required for an entry job as a business machine repairer varies widely among employers. Many employers hire applicants with a high school education, while some require at least 1 year of technical training in basic electricity or electronics. Electronics training received in the Armed Forces also is valuable. Related experience is helpful, and many workers transfer from other jobs.

Employment patterns. Job prospects for business machine repairers should be excellent through the 1980's. Employment is projected to grow much faster than the average for all occupations as businesses and government agencies buy more machines to handle a growing volume of paperwork. Between 12,000 and 13,000 job openings are projected each year due to the increased demand for business machine repairers and the need to replace experienced workers who stop working or transfer to other occupations. Although replacement needs are expected to account for three-fourths of job openings for repairers, they are a much less significant source of openings than in other craft occupations.

In 1980, about 13 percent of all business machine repairers left their jobs, slightly less than the proportion of other craft workers or of all mechanics and repairers. More than two-fifths of those who left the occupation transferred to other occupations—such as data processing machine repairer or manufacturer's sales worker. A few probably advanced to manager of a service repair department. About 3 of every 10 repairers who left their jobs in 1980 became unemployed. Most of those who lost their jobs were below the age of 25 and had no training beyond high school; employers lay off their least experienced and productive workers when they reduce the number of people in their service departments. About one-quarter of those who left their jobs dropped out of the labor force—many of these returned to school.

Seven of every 10 job openings for business machine repairers in 1980 were filled by experienced workers who transferred from other occupations. Many of those who transferred probably worked in related occupations where they serviced mechanical and electronic equipment such as home appliances, automotive electrical systems, and radio and television equipment. Most of the remaining job openings were filled by persons who had been unemployed.

Employment, 1980	55,000		
Projected employment, 1990	89,000	–	96,000
Percent change, 1980-90	59.8	–	73.5
Average annual openings, 1980-90	12,000	–	13,000
Growth	3,500	–	4,000
Replacement	8,500	–	9,000

Buyers

Training. An increasing number of employers prefer applicants who have a college degree. Many colleges and universities offer associate degree or bachelor's degree programs in marketing and purchasing. Related experience also is valuable, and many people transfer into the occupation.

While courses in merchandising or marketing may help in getting started in retailing, they are not essential. Most employers accept college graduates in any field of study and train them on the job. Many stores have 6- to 8-month programs for buyer trainees. They combine classroom instruction in merchandising and purchasing with short rotations to various jobs in the store. This training introduces the new worker to store operations and policies, and to the fundamentals of merchandising and management. Most trainees begin as assistant buyers; they usually work as assistants for at least a year before becoming buyers.

Employment patterns. Employment of buyers is projected to grow about as fast as the average for all occupations through the 1980's as the retail trade industry expands in response to a growing population and higher personal incomes. Between 26,000 and 28,000 job openings are projected each year due to the increased demand for buyers and the need to replace experienced workers who stop working or transfer to other occupations. Replacement needs are expected to be the major source of jobs for buyers during the 1980's, accounting for more than 8 of 10 openings. Competition for jobs as buyers is expected to be keen because merchandising attracts many college graduates.

During 1980, about 15 percent of all buyers left the occupation, compared to 12 percent of all managers. Nearly 6 of every 10 buyers who left transferred to other occupations. Some were experienced buyers who probably advanced to merchandise manager or to an executive job such as general merchandise manager for a store or chain. Three of every 10 buyers who left their jobs dropped out of the labor force, either to take up household responsibilities or to retire. One buyer in 8 became unemployed.

About 7 of every 10 job openings for buyers in 1980 were filled by workers who transferred from other occupations. Many of these workers probably had experience in retail sales, which is valuable to buyers because they must be familiar with merchandise and shoppers' preferences. About one-fourth of all job openings were filled by people who had not worked the previous year; one-half of them were college graduates.

Employment, 1980[1]	149,000		
Projected employment, 1990	178,000	–	190,000
Percent change, 1980-90	19.7	–	27.4
Average annual openings, 1980-90	26,000	–	28,000
Growth	3,000	–	4,000
Replacement	23,000	–	24,000

[1] Includes only buyers employed in retail trade.

Carpenters

Training. Carpenters learn their trade on the job. Many pick up their skills by working as a helper to an experienced carpenter; however, some participate in structured training programs run by their employer. Most training authorities recommend completion of an ap-

prenticeship because it includes training in all the skills of the trade. These programs are administered by local union-management committees and local contractors' associations. Apprenticeship consists of 4 years of on-the-job training and a minimum of 144 hours of related classroom instruction each year. However, apprentices can complete the program in less than 4 years if they can demonstrate mastery of the required skills.

A high school or vocational school education that includes courses in carpentry, shop, mechanical drawing, and general mathematics is desirable.

Employment patterns. Employment of carpenters is projected to increase about as fast as the average for all occupations through the 1980's. In the long run, construction activity should increase in response to increasing demand for new housing and industrial plants and as existing industrial plants are renovated to make them more productive and energy efficient. Prospects for people wishing to become carpenters generally are expected to be good because of the many job openings created by growth and replacement needs.

Between 180,000 and 195,000 jobs are projected to be available each year due to increased demand for carpenters and the need to replace carpenters who leave their jobs. Nine of every 10 job openings for carpenters through the 1980's are expected to result from replacement needs.

Nearly 25 percent of all carpenters left their jobs in 1980, a higher proportion than for other construction trades. About 9 percent of all carpenters transferred to other occupations, also a higher proportion than for other construction crafts. The lower than average attachment to the occupation reflects the comparative ease of entry. Many people take jobs as carpenters with no intention to making it a career and then transfer to other jobs after a short time. However, some experienced carpenters enter other occupations when carpentry work is unavailable.

Eight percent of all carpenters became unemployed during 1980, nearly twice the proportion for other craft occupations. This reflects the short-term nature of many construction projects—particularly in residential building, where many carpenters are employed—as well as the impact of cyclical fluctuations in the economy. The large proportion of carpenters who become unemployed means that there usually is a supply of experienced carpenters available.

About 6 percent of all carpenters left the labor force during 1980. Some returned to school, but most retired. About one-half of those age 55 and older who left the labor force had worked part time, possibly indicating that some carpenters gradually reduce the number of hours they work until they finally retire. Many carpenters who left the labor force did so temporarily and will later reenter the occupation.

Seven of every 10 job openings during 1980 were filled by people who had not been working the previous year. Fifty-five percent of these had been unemployed—many were experienced carpenters who had been laid off. The rest were labor force entrants or reentrants. Some had been in school. Most, however, had dropped out of the labor force temporarily waiting for jobs to became available. One-third of all job openings for carpenters in 1980 were filled by transfers from other occupations.

People entering the occupation should expect to experience periods of unemployment between jobs. Because many people are qualified for and seek carpentry jobs, competition may exist for the highest paying jobs, even when construction activity is high. Carpenters can improve their chances of getting a steady, year-round job by acquiring all-round skills.

Employment, 1980	970,000		
Projected employment, 1990	1,143,000	–	1,230,000
Percent change, 1980-90	17.9	–	27.0
Average annual openings, 1980-90	180,000	–	195,000
Growth	17,000	–	26,000
Replacement	163,000	–	169,000

Cashiers

Training. Employers hire individuals without any work experience for many cashier jobs. They prefer those who are high school graduates. Many public school vocational programs offer cashier training. Courses in business arithmetic, bookkeeping, typing, and selling are useful for this work. However, new cashiers usually receive on-the-job training. In large firms, cashiers often receive classroom instruction in the use of electronic or computerized registers and in other phases of a cashier's work. In smaller ones, they are trained by an experienced worker. Employers look for persons who are able to do repetitious work accurately, have a high degree of eye-hand coordination, and have an aptitude for working with figures.

Employment patterns. Job openings for cashiers are expected to be plentiful during the 1980's due to the relatively high rate of turnover in the occupation. Between 650,000 and 680,000 jobs are projected to be available annually—among the highest for any occupation. Although employment is projected to grow faster than the average for all occupations, 9 out of 10 job openings are expected to result from a need to replace people who transfer to other occupations or stop working.

Cashiering jobs generally require little or no experience and little education; most are part time. Therefore, they attract people who want to gain work experience, or to earn money while in school or while tending to household responsibilities. Data on the experience of workers in 1980 indicate that cashiers have very little

labor force or job attachment. The separation rate for cashiers is one of the highest among all occupations. About 1 out of every 3 cashiers left the occupation in 1980—more than one and one-half times the rate for all workers.

About 14 percent of all cashiers left the labor force during 1980, a much higher rate than for individuals in most other occupations. Most became full-time homemakers or returned to school. Since this occupation consists primarily of young workers, relatively few cashiers retired or stopped working because of disability. Another 14 percent of all cashiers transferred to other occupations, also a much higher than average rate. About 4 percent of all cashiers became unemployed in 1980.

About 70 percent of those who entered the occupation during 1980 had not been working the previous year. One-fifth had been unemployed. The rest were mainly persons 19 or younger who had been in school and persons 25 and older who had been involved with household responsibilities.

About one-half of all job openings for cashiers in 1980 were filled by persons who were 19 years or younger, and almost three-quarters were 24 years or younger. Two out of every 3 job openings were part-time positions. Persons who had not been working the previous year exhibited a much greater tendency to take part-time work than those who were transferring from other occupations.

Employment, 1980	1,592,000		
Projected employment, 1990	2,045,000	-	2,163,000
Percent change, 1980-90	28.4	-	35.8
Average annual openings, 1980-90	648,000	-	679,000
Growth	45,000	-	57,000
Replacement	603,000	-	622,000

Compositors and typesetters

Training. In the past, almost all compositors were trained through some type of apprenticeship program. However, in recent years, the introduction of new technology has reduced the demand for all-round skilled compositors. As a result, more and more compositors are bypassing the traditional apprentice approach and are learning the work on the job.

In large companies, persons who want to become all-round compositors generally are trained through an apprenticeship program. Most of those programs emphasize training in the operation of phototypesetting machines and in photocomposition work. Generally, apprenticeship covers a 4-year period of training supplemented by classroom instruction or correspondence courses. However, this period may be shortened by as much as 2 1/2 years for persons who have had previous experience or schooling or who show the ability to learn the trade more rapidly.

Applicants generally must be high school graduates and in good physical condition. Training in mathematics and English, especially spelling, is useful. Printing and typing courses in vocational or high schools are good preparation, and a general background in electronics and photography is becoming increasingly useful. Many technical institutes, junior colleges, and colleges offer courses in printing technology which provide a valuable background.

Persons with good typing skills can learn to be phototypesetting machine operators in a relatively short period of time. These workers need not be trained as skilled compositors, but they must be familiar with printing terms and measures.

Employment patterns. Despite growth in the volume of printing, employment of compositors and typesetters is projected to decline through the 1980's as high-speed phototypesetting machines and typesetting computers increasingly displace the traditional hot-metal method of typesetting, which requires more operators. Consequently, many monotype and linotype operators have been retrained as phototypesetting operators in recent years. Nevertheless, between 21,000 and 22,000 job openings are projected each year through 1990 to replace experienced workers who change occupations or stop working.

In 1980, about 17 percent of all compositors and typesetters left their jobs, a proportion similar to that for craft occupations as a group. Nearly half of them transferred to other occupations—most likely to growing printing occupations such as lithographer or printing press operator or to other skilled or semiskilled jobs. Over half left the labor force altogether or became unemployed. Of those compositors and typesetters who stopped working, almost one-third assumed household responsibilities—nearly 5 times the proportion who left their job for this reason among all craft workers. This pattern reflects the relatively large proportion of women in this occupation compared to other craft occupations.

Over 70 percent of those who entered the occupation during 1980 transferred from other jobs. In comparison, only 53 percent of all craft jobs were filled by transfer. Many of those who transferred probably were secretaries and typists who were highly qualified to become phototypesetting machine operators and who were attracted to the occupation by higher wages. About 30 percent of the jobs were filled by persons who had not worked the previous year. Of these, 36 percent had household responsibilities. In comparison, of all persons who entered craft occupations in 1980 and who had not worked the previous year, only 7 percent had household duties—again reflecting the relatively high proportion of women in this craft occupation.

Over half of those persons who took jobs as compositors and typesetters in 1980 were 20-24 years of age—double the proportion of jobs filled by persons in this age bracket for all craft workers or all occupations combined.

Seventy percent of all jobs for compositors and typesetters in 1980 were filled by persons with a high school education or less. One-fourth of those who took jobs in this occupation had some postsecondary education. Relatively few openings were filled by college graduates.

Employment, 1980	128,000		
Projected employment, 1990	116,000	–	125,000
Percent change, 1980-90	-9.6	–	-2.4
Average annual openings, 1980-90[1]	21,200	–	22,100
Decline	(-1,200)	–	(-300)
Replacement	21,200	–	22,100

[1] Data on the decline in employment are presented in parentheses for information only, since replacement needs are the sole source of openings. See appendix B.

Computer operators

Training. Most employers require computer operators to have a high school education or specialized training or experience. Many prefer to hire computer operators who have had some community or junior college training, especially in data processing. Many employers test applicants to determine their aptitude for computer work, particularly their ability to reason logically. Prior experience is important, and many workers transfer into this occupation.

Employment patterns. Employment of computer operators is projected to rise much faster than the average for all occupations through the 1980's because of the increasing use of computers. Between 67,000 and 72,000 job openings are expected to be available each year during the 1980's due to the increased demand for computer operators and the need to replace experienced workers who stop working or transfer to other occupations. Although replacement needs are expected to account for three-fourths of all openings, they are a much less significant source of openings than for all clerical workers.

During 1980, 17 percent of all employed computer operators left the occupation. In comparison, 22 percent of all clerical workers left their occupation. This relative stability is due to a shortage of experienced operators and reflects the relatively high earnings of these workers. Nearly three-fifths of those who left the occupation transferred to other occupations. One-fourth of them advanced to computer programmer, another data processing occupation experiencing a shortage of skilled workers. Some operators left the labor force, mostly to take up household responsibilities or to return to school. Relatively few operators became unemployed.

Six of every 10 job openings for computer operators during 1980 were filled by experienced workers who transferred from other occupations; this was a significantly higher proportion than for all clerical jobs. Many jobs were filled by secretaries, typists, bookkeepers, and others familiar with various kinds of office equipment. Most of those who transferred into the occupation were under the age of 35 and had a high school education or less.

Four of every 10 entrants had not worked the previous year. Most had not been in the labor force the previous year—primarily persons who had assumed family responsibilities or had been in school. Homemakers who entered the occupation tended to be older than other entrants—almost all were over 25—reflecting the tendency of many women to wait until their children are in school before they go back to work. Most of these entrants had a high school education or less. In contrast, computer operators who had been in school the previous year tended to be younger—almost all were under 25—and more than one-third had some training beyond high school.

Employment, 1980[1]	233,000		
Projected employment, 1990	387,000	–	412,000
Percent change, 1980-90	65.8	–	76.6
Average annual openings, 1980-90	67,000	–	72,000
Growth	15,000	–	18,000
Replacement	52,000	–	54,000

[1] Includes computer operators and peripheral EDP equipment operators.

Computer service technicians

Training. Most employers require applicants for entry jobs as computer service technicians to have completed 1 to 2 years of post-high school training in basic electronics or electrical engineering at a vocational school, junior college, or university. Many employers also consider basic electronics training provided by the Armed Forces excellent preparation. Related work experience also is valuable preparation, and many technicians transfer from another occupation. Regardless of background, newly hired workers can expect some on-the-job training in order to learn their employer's system.

Employment patterns. Job prospects should be excellent through the 1980's. Employment of computer service technicians is projected to rise much faster than the average for all occupations through the 1980's as the number of computers in operation continues to increase. Demand for technicians is expected to rise even faster than the increase in the number of computers as computer equipment becomes more decentralized. In addition to job openings created by rapid growth in demand

for computer service technicians, many openings are projected to arise as employers replace workers who transfer to another occupation or leave the labor force.

Data on the experience of workers in 1980 indicate that technicians have a strong attachment to their occupation. In fact, the separation rate for technicians is one of the lowest among all workers. Therefore, although replacement needs are expected to account for 6 of every 10 openings, they are a much less significant source of openings than in most occupations.

Only about 1 computer service technician in 20 transferred to a different occupation in 1980, well below the proportion for most occupations. Relatively few became unemployed—only about 1 in 100. This pattern reflects the fact that these workers are in a rapidly growing field that offers many opportunities for advancement, high earnings, and good working conditions. Retirements also were uncommon—about 2 in 100—reflecting the low average age in this relatively new occupation.

About 6 of every 10 openings for computer service technicians in 1980 were filled by workers in their mid- to late 20's who had worked for several years in another occupation. Occupations that require a knowledge of electronics and provide a good background for computer service technicians are business machine repairer, television service technician, and engineering technician. A signficiant number of openings, however, were filled by recent graduates of electronics training programs offered in 2-year postsecondary schools. Some entered the occupation from military service, where they had received electronics training and work experience.

Employment, 1980	83,000		
Projected employment, 1990	160,000	-	176,000
Percent change, 1980-90	93.3	-	112.4
Average annual openings, 1980-90	19,000	-	21,000
Growth	8,000	-	9,000
Replacement	11,000	-	12,000

Cooks and chefs

Training. Many cooks begin as kitchen helpers, and acquire their skills on the job. An increasing number obtain training in commercial food preparation through high school or post-high school vocational programs or community colleges. Cooks and chefs are also trained in apprenticeship programs offered by professional associations and trade unions, and in 3-year apprenticeship programs administered by local offices of the American Culinary Federation in cooperation with local employers and junior colleges or vocational education institutions. In addition, some large hotels and restaurants operate their own training programs for new employees. The Armed Forces also are a good source of training and experience.

Only a short period of training or experience is required to become an assistant or fry cook, but many years are necessary to achieve the level of skill required of an executive chef or cook in a fine restaurant. Even though a high school diploma is not required for beginning jobs, it is recommended for those planning a career as a cook or chef. Also, many courses in commercial food preparation are open only to high school graduates.

Employment patterns. Between 399,000 and 417,000 jobs for cooks and chefs are projected to be available each year through the 1980's. Small restaurants, school cafeterias, and other eating places with simple food preparation should provide the greatnest number of job openings for cooks. Employment of cooks and chefs is projected to grow about as fast as the average for all occupations as the population expands and people dine out more. However, the need to replace experienced cooks and chefs who transfer to other jobs or stop working is expected to account for more than 9 out of 10 job openings—similar to the proportion for all occupations combined.

The separation rate for cooks and chefs is one of the highest among all workers. About 30 percent of all cooks and chefs left their jobs in 1980, compared to only 20 percent of all workers combined. However, patterns most likely differ among cooks in various employment settings. Institutional cooks and restaurant cooks probably remain in their occupation in higher proportions than short order and specialty fast-food cooks. Nearly half of all cooks and chefs who left their jobs transferred to other occupations, about 40 percent left the labor force, and the remainder became unemployed. Of those who stopped working, over 35 percent assumed household duties; over 20 percent left to go to school—nearly double the proportion who left their jobs for this reason among all workers.

Similar to all service workers, except private household workers, only about 30 percent of those who entered the occupation during 1980 transferred from other jobs—compared to well over 40 percent for all workers. Over 70 percent of those who entered the occupation had not worked the previous year, primarily young students working to earn spending money or money for school and older homemakers working to supplement family income. Of these cooks and chefs who were not working the previous year, about one-third had been in school (virtually all were less than 25 years old) and nearly 30 percent had household responsibilities (nearly all were over 25 years old, primarily in the 35-54 age range). About 16 percent of those who entered the occupation in 1980 were 15 years old—triple the proportion for all occupations combined. Overall, about 50 percent of the job openings for cooks and chefs in 1980 were filled by persons who were 15-19 years old, com-

pared to 36 percent for all service workers, except private household workers, and 22 percent for all occupations combined.

Entrance requirements in this occupation are minimal; individuals with a high school education or less filled 85 percent of the job openings in 1980, compared to 67 percent for all occupations combined. About 13 percent had completed some postsecondary education; relatively few jobs were filled by college graduates.

Nearly two-thirds of the job openings for cooks and chefs in 1980 were part time, compared to only one-third of the openings for all occupations combined. Persons who had not worked the previous year, including those age 15, filled about three-fourths of these part-time jobs for cooks and chefs. The availability of part-time jobs that do not interfere with other responsibilities makes this occupation attractive to students and homemakers.

Employment, 1980[1]	1,122,000		
Projected employment, 1990	1,365,000	–	1,437,000
Percent change, 1980-90	21.6	–	28.0
Average annual openings, 1980-90	399,000	–	417,000
Growth	24,000	–	31,000
Replacement	375,000	–	386,000

[1] Includes institutional cooks, restaurant cooks, and short order and specialty fast-food cooks.

Cosmetologists

Training. All States require cosmetologists to be licensed. Most require applicants to be at least 16 years old and pass a physical examination. Some States require a high school diploma. Successful completion of a State-approved cosmetology course is appropriate preparation for the State licensing examination. In some States, completion of an apprenticeship program can substitute for graduation from cosmetology school, but few cosmetologists learn their skills this way. Both public and private vocational schools offer training in cosmetology. A daytime course usually takes 6 months to 1 year; an evening course takes longer. An apprenticeship generally lasts 1 or 2 years.

Employment patterns. Between 77,000 and 90,000 job openings are projected each year during the 1980-90 period. Replacements for cosmetologists who stop working or transfer to other occupations are expected to account for more than 4 out of 5 openings. The rest will result from employment growth; the rate of growth will depend upon factors such as overall population growth, the proportion of women who work, and the degree to which men patronize "unisex" hairstyling salons.

Cosmetologists show a much stronger tendency than other service workers to stay in their occupation. In 1980, only 1 out of 10 cosmetologists left his or her job, a proportion comparable to that for professional and technical workers. When cosmetologists do leave their jobs, they tend to leave the labor force—relatively few transfer to other jobs or become unemployed. This attachment to the occupation is noteworthy in light of the relatively limited investment in training, which can be acquired in a high school vocational educational program.

For many young women, cosmetology serves as an entry point to the world of work. Nine out of every 10 cosmetologists are women, and most job entrants are under the age of 35. However, the field also is characterized by a pattern of movement from family responsibilities into the labor force and back to the home again. In 1980, most entrants to the occupation came from outside the labor force, from homemaking or school in almost equal numbers. Those who left their jobs assumed household responsibilities, for the most part.

Compared to the number who move to or from homemaking, relatively few persons transfer to or from other occupations. In 1980, the proportion of cosmetologists who transferred to or from other kinds of jobs was significantly smaller than that for all service occupations, or for the economy as a whole. Nonetheless, some cosmetologists use their specialized knowledge to move into related occupations: They may manage large salons, demonstrate cosmetics in department stores, become sales representatives for cosmetics firms, act as beauty or fashion consultants, teach in cosmetology schools, or work as examiners for State cosmetology boards.

About half of those who entered cosmetology in 1980 took part-time jobs. Individuals entering from homemaking were more likely than those who had been students to choose part-time work. Women who combine parental and job responsibilities probably prefer a part-time schedule when they first return to work. This relatively high proportion of part-time work is typical of service occupations in general and personal service occupations in particular.

Recent graduates of cosmetology training programs who pass the licensing examination are the principal source of supply. In 1980, over 73,000 licenses were granted, according to data compiled by the Milady Publishing Corporation. The number of people passing the State licensing examinations has fluctuated between 55,000 and 85,000 a year over the past two decades. Augmenting the supply of newly trained cosmetologists is a large reserve pool of licensed but professionally inactive cosmetologists who may reenter the occupation when employment and earnings opportunities are attractive enough.

Employment, 1980[1]	514,000		
Projected employment, 1990	584,000	–	664,000
Percent change, 1980-90	13.7	–	29.3
Average annual openings, 1980-90	77,000	–	90,000

Growth	7,000	-	15,000
Replacement	70,000	-	75,000

[1] Includes cosmetologists and women's hairstylists, manicurists, scalp treatment operators, and shampooers.

Dental assistants

Training. Most dental assistants learn their skills on the job. However, some are trained in 1- to 2-year dental assisting programs offered by community and junior colleges, trade schools, and technical institutes. Some schools offer 4- to 6-month courses in dental assisting, but these are not accredited programs. Individuals who complete dental assistant training in the Armed Forces usually qualify for civilian jobs as dental assistants.

In 1979-80, about 7,000 individuals completed public vocational education programs in dental assisting, another 4,500 completed private trade school programs, and about 3,300 completed community or junior college programs.

Employment patterns. Employment opportunities for dental assistants are expected to be good through the 1980's because of the relatively large number of job openings and the ease of entry into this occupation. About 45,000 dental assisting jobs are projected to become available on average each year during the 1980's because of faster than average employment growth and the need to replace experienced dental assistants who stop working or transfer to other occupations. Replacement needs are substantial and are expected to account for about 7 out of 8 job openings, a much higher proportion than in other allied health occupations.

In 1980, nearly one-fourth of all dental assistants left their jobs. Half of them left the labor force altogether—to go to school or assume household responsibilities, for the most part. Over one-third transferred to another job and the rest became unemployed. Of those who entered the occupation during 1980, only about 30 percent transferred from other jobs. The others had not worked the previous year—most because they had been busy with school or household duties. Nearly 7 out of 10 jobs were filled by people with a high school education or less. The remainder were filled by people who had attended college, although relatively few were college graduates.

Dental assistants' patterns of occupational entry and exit reflect the fact that the occupation is dominated by young women. Ninety-nine percent of all dental assistants are female, and young people are the major source of supply. In 1980, well over one-third of all job openings were filled by teenagers (16-19 years), nearly all of whom had been in school the previous year. Many, undoubtedly, were still in school, for quite a few high school and college students work part time in dental assisting jobs. Part-time work is far more prevalent among dental assistants age 16-19 than among those age 20 and above. Those entering the occupation between the ages of 25 and 34 are somewhat more likely to be returning to the job market than to be changing jobs.

Employment, 1980	140,000		
Projected employment, 1990	191,000	-	198,000
Percent change, 1980-90	38.0	-	42.4
Average annual openings, 1980-90	44,300	-	45,700
Growth	5,300	-	5,900
Replacement	39,000	-	39,800

Dental laboratory technicians

Training. Most dental laboratory technicians learn their craft on the job, usually in 3 to 4 years. High school graduates are preferred, and courses in art, metal shop, and science are helpful. Many of those hired as trainees already have some knowledge of dental laboratory work, usually because they have taken courses or completed formal training programs.

Training in dental laboratory technology is available through community and junior colleges, vocational-technical institutes, and trade schools; high school vocational education programs; apprenticeships; and the Armed Forces. Formal training programs vary greatly, both in length and the level of skill they impart. Accredited programs generally take 2 years to complete and lead to an associate degree, although some lead to a certificate or diploma.

In 1979-80, approximately 1,500 individuals completed public vocational education programs in dental laboratory technology; about 1,600 completed trade school programs; and 850 earned associate degrees in community or junior college programs. The number enrolled in dental laboratory technology programs of all kinds was higher than these figures suggest, for many students—vocational education students and apprentices in particular—drop out before completing the entire sequence of courses. Students who have taken enough courses to learn the basics of the craft generally are considered by employers to be good candidates for training, regardless of whether they have completed the formal program.

Employment patterns. Between 3,500 and 4,500 job openings for dental laboratory technicians are projected on average each year during the 1980's due to faster than average employment growth and the need to replace experienced technicians who leave the occupation. Replacement needs will account for roughly half of future job openings in the occupation; replacements are a much less important source of jobs for dental laboratory technicians than for most other workers. Replacements are expected to account for nearly 9 out of 10 openings for all craft workers during the 1980-90 period.

Dental laboratory technicians exhibit a relatively strong attachment to the field. Fewer than 10 percent left the occupation in 1980, compared to 20 percent of all workers. Experienced workers who left dental laboratory technology during 1980 transferred to other occupations, for the most part. Relatively few left the labor force or became unemployed. Most of those who did leave the labor force were older technicians who retired.

Currently, most entrants to this occupation are people under the age of 35 who have had some postsecondary education—although relatively few are college graduates. The rest transfer to dental laboratory jobs from other occupations.

Employment, 1980	53,000		
Projected employment, 1990	69,000	–	79,000
Percent change, 1980-90	29.0	–	48.7
Average annual openings, 1980-90	3,600	–	4,900
Growth	1,500	–	2,600
Replacement	2,100	–	2,300

Dentists

Training. A license to practice dentistry is required in all States and the District of Columbia. In most States, a candidate for licensure must graduate from a dental school approved by the American Dental Association and pass written and practical examinations. In 1980, candidates in 48 States and the District of Columbia could fulfill part of the State licensing requirements by passing a written examination given by the National Board of Dental Examiners. Most State licenses permit dentists to engage in both general and specialized practice. In 14 States, however, a dentist cannot be licensed as a specialist without having 2 or 3 years of graduate education and, in some cases, passing a special State examination. In the other 36 States, the extra education also is necessary, but a specialist's practice is regulated by the dental profession, not the State licensing authority. Dentists who want to teach or do research usually spend an additional 2 to 4 years in advanced dental training in programs offered by dental schools, hospitals, and other institutions.

Employment patterns. About 4,500 job openings for dentists are projected each year during the 1980-90 period. Two out of 3 openings are expected to arise because of employment growth. Demand for dentists' services is expected to be heightened by population growth, increased awareness of the benefits of regular dental care, and greater availability of dental insurance. Replacements for dentists who stop working or transfer to other occupations are expected to account for only 1 of every 3 openings, an unusually small proportion compared to the average for all workers (9 out of 10).

Dentists exhibit a strong attachment to work and to the dental profession. Once having completed their training and entered dental practice, dentists tend to work continuously until they reach retirement age. Some older dentists stop working because of ill health. Relatively few leave the labor force because of household responsibilities. The number of women in the profession is quite small, less than 3 percent of the total in 1980. Women are beginning to play a more prominent role in dentistry, however. Their share of first-year dental school enrollments rose from 2 percent to nearly 20 percent during the decade of the 1970's.

Relatively few people leave dentistry to take up other careers. Nearly 99 percent of all dentists employed at the beginning of 1980 were active in the profession a year later. Such a high degree of occupational attachment is found in only a few other occupations, notably among other health practitioners, who, like dentists, have a considerable investment in training.

Recent dental school graduates constitute the principal source of supply of new dentists. Since licensure takes 8 years or more following graduation from high school, job openings for dentists are filled almost exclusively by persons age 25-34. A few jobs are filled each year by older entrants, including licensed dentists who had left the civilian labor force temporarily because of military service or disability.

The number of dental school graduates rose sharply from the mid-1960's until the mid-1970's, as new dental schools were established. The expansion has moderated in recent years, and enrollments are likely to level off or decline somewhat during the 1980's. Nevertheless, the number of newly qualified dentists entering the labor market each year will be substantial. As a result, an oversupply of dentists may develop in some localities and intensify in others. If so, various market adjustments are likely—reductions in hours of work, reductions in earnings, and less intensive use of dental assistants and dental hygienists, for example.

Employment, 1980[1]	126,000
Projected employment, 1990[1]	155,000
Percent change, 1980-90	23.0
Average annual openings, 1980-90	4,500
Growth	2,900
Replacement	1,600

[1] Current and projected employment estimates furnished by the Bureau of Health Professions.

Drafters

Training. Most employers prefer applicants for entry level jobs as drafters to have completed some postsecondary drafting training in a technical institute, junior or community college, or extension division of a university. Some employers hire persons who were trained in

vocational and technical high schools or who acquired drafting experience in the Armed Forces. Others qualify through on-the-job training programs combined with part-time schooling or through 3- to 4-year apprenticeship programs.

About 34,000 persons completed vocational education programs in drafting during 1979-80, according to the National Center for Education Statistics, and nearly 7,000 persons earned associate degrees and certificates in architectural drafting and engineering graphics in academic year 1979-80. However, rates of entry into this occupation among graduates of these programs are unknown. In addition, some graduates may be drafters seeking to upgrade their skills.

Employment patterns. Employment of drafters is projected to grow faster than the average for all occupations through the 1980's as industries in which drafters are highly concentrated, such as engineering and architectural services and durable goods manufacturing, expand. Persons with an associate degree in drafting and those trained in the use of computer-aided drafting systems should have the best employment prospects.

Employment growth is projected to create between about 9,000 and 13,000 job openings each year. However, between about 46,000 and 48,000 openings—about 4 out of every 5—are expected to arise from the need to replace drafters who retire or leave the occupation for other reasons. Still, replacement needs are a less significant source of job openings for drafters than for most other occupations.

Data on the experience of workers in 1980 indicate that drafters leave their occupation in about the same proportion as most other professional and technical workers. Less than 13 percent of all drafters left the occupation. About half of the workers who left transferred to other occupations. The rate of transfer out of this occupation was slightly lower than the rate for many other engineering technician occupations. This may be because many engineering technicians learn technical skills that are easily transferred to repair and maintenance work, such as appliance and television repair, while drafting skills are somewhat more specialized. About one-quarter of the drafters who left the occupation in 1980 left the labor force altogether—primarily to attend school or retire. The remainder became unemployed.

In 1980, nearly three-fifths of all entrants into drafting had some college or other postsecondary education. Less than one-third of the job openings were filled by those having a high school education or less. The remaining entrants were college graduates. Persons in the 20-24 age range filled most job openings for drafters.

About two-thirds of all job openings for drafters in 1980 were filled by persons who had not worked the previous year. About half of these persons had been in school. In comparison, of all persons who entered professional and technical occupations in 1980 and had not worked the previous year, only 30 percent had been in school. This difference may be explained by the occupational orientation of educational programs in drafting, which makes the transition from school to work relatively easy.

Only about one-third of the job openings in 1980 were filled by workers who transferred from other occupations. In comparison, nearly one-half of openings in all professional and technical occupations were filled through transfer. Employers of drafters seek applicants with drafting skills, and few workers in other occupations acquire these skills.

Employment, 1980	322,000		
Projected employment, 1990	411,000	–	445,000
Percent change, 1980-90	27.9	–	38.5
Average annual openings, 1980-90	55,000	–	61,000
Growth	9,000	–	13,000
Replacement	46,000	–	48,000

Electricians

Training. Electricians learn their skills on the job. Many people learn the trade informally by working for several years as an electrician's helper. Most training authorities, however, recommend participation in an apprenticeship program as the best way to learn the trade. Apprentices receive training in all aspects of the trade and as a result have a better chance to get a good job. Apprenticeships usually last 4 years, and consist of on-the-job training and related classroom instruction in subjects such as mathematics, electrical and electronic theory, and blueprint reading.

Persons interested in becoming electricians can obtain a good background by taking high school or vocational school courses in electricity, electronics, algebra, mechanical drawing, shop, and science. Applicants for apprenticeship usually must be high school or vocational school graduates and have completed 1 year of algebra.

Most local governments require electricians to be licensed. Electricians can get a license by passing an examination that tests their knowledge of the trade and local electrical codes.

Employment patterns. Employment of electricians is projected to increase about as fast as the average for all occupations during the 1980's. As the economy expands, more electricians should be needed to maintain the electrical systems used by industry and to install electrical fixtures and wiring in new homes, factories, stores, and other structures. Between 63,000 and 69,000 jobs are expected to be available each year during the 1980's due to the increased demand for electricians and the need to replace experienced workers who stop

working or transfer to other occupations. About 8 of every 10 job openings are expected to result from replacement needs. Although the annual number of job openings for electricians is expected to be large, people wishing to enter the occupation are likely to face competition. High wages attract many people to the trade. People planning a career in this trade can improve their chances for a steady job by acquiring good, all-round training.

Electricians exhibit a strong attachment to the occupation. Electricians are not inclined to transfer to other occupations because they have a sizable investment in training and because their earnings are relatively high. Less than 3 percent of all electricians transferred out of the occupation in 1980, less than one-half the rate for other crafts.

Most electricians who left their jobs in 1980 became unemployed or left the labor force. They accounted for 3 of every 4 separations from the occupation, compared to 1 of 2 for other crafts. Nearly one-half of all electricians in 1980 worked in construction, where job openings fluctuate with the level of building activity. About 6 of 10 electricians who stopped working in 1980 became unemployed. Many probably were laid off when their projects were completed. The remainder of those who stopped working had left the labor force; most of these were older workers who had retired.

During 1980, 54 percent of the job openings for electricians were filled by persons who had been unemployed or out of the labor force, indicating that skilled electricians who are not currently working make up a significant part of the potential supply of labor. People who transferred from other occupations filled 46 percent of the job openings for electricians.

Most workers who entered the occupation in 1980 had a high school diploma or less education. Fifty-five percent were more than 35 years old, compared to 30 percent for all craft occupations.

Employment, 1980	560,000		
Projected employment, 1990	669,000	–	717,000
Percent change, 1980-90	19.5	–	28.0
Average annual openings, 1980-90	63,000	–	69,000
Growth	11,000	–	16,000
Replacement	52,000	–	53,000

Engineering and science technicians

Training. Although persons can qualify for technician jobs through many combinations of work experience and education, most employers prefer applicants who have had some specialized technical training. Specialized training is available at technical institutes, junior and community colleges, extension divisions of colleges and universities, and public and private vocational-technical schools. A few engineering and science students who have not completed the bachelor's degree and others who have degrees in science and mathematics also qualify for many technician jobs.

Workers also can qualify as technicians through apprenticeship programs or correspondence school training. Some qualify on the basis of experience gained in the Armed Forces. Some persons learn the needed skills by less formal training on the job. However, postsecondary training is becoming increasingly necessary for advancement.

Nearly 83,000 persons earned associate degrees and certificates in engineering and science technologies during academic year 1979-80, according to the National Center for Education Statistics. In addition, about 54,000 persons completed public and private vocational education programs in engineering and science technologies during 1979-80. However, rates of entry into this occupation among graduates of these programs are unknown. In addition, some graduates may be engineering or science technicians seeking to upgrade their skills.

Employment patterns. Employment opportunities for engineering and science technicians are expected to be favorable through the 1980's in view of the large number of projected job openings—168,000 to 183,000 annually. Opportunities should be best for graduates of postsecondary technician training programs.

Industrial expansion, the increasing complexity of modern technology, and the growing importance of energy development and other areas of scientific research are projected to spur faster than average growth in the employment of engineering and science technicians. However, the need to replace experienced technicians who transfer to other jobs or stop working is expected to account for about 85 percent of all job openings—about the same as for all professional and technical occupations combined.

In 1980, 15 percent of all engineering and science technicians left their jobs—compared to 20 percent for all occupations combined and 11 percent for all professional and technical workers. Nearly three-fifths of the engineering and science technicians who left transferred to other occupations. Some engineering and science technicians, such as electrical and electronic technicians, possess skills that can be transferred to repair and maintenance jobs, such as television and radio repair. Over two-fifths of all engineering and science technicians who left their jobs in 1980 stopped working. Many left the labor force as retirees or to attend school; some became unemployed. Relatively few assumed household duties—reflecting the relatively small proportion of women in this occupation compared to other professional and technical occupations.

In 1980, persons transferring into the occupation filled about half of all job openings—similar to the pattern for all professional and technical workers. Of the persons who had not worked the previous year, over two-

fifths had been in school. In comparison, of all persons who entered professional and technical occupations in 1980 and who had not worked the previous year, only 30 percent had been in school. This difference may be explained by the occupational orientation of educational programs in this field, which makes the transition from school to work relatively easy.

Nearly one-half of those who took jobs as engineering and science technicians in 1980 had some postsecondary education. One-third had a high school education or less. One-fifth were college graduates—most likely science graduates. In the face of a competitive job market, some graduates with a bachelor's degree in science accepted positions as technicians. On the other hand, virtually all engineering graduates found professional positions in their field.

Persons 20-34 years old filled 80 percent of all job openings for engineering and science technicians in 1980—somewhat higher than the proportion of openings filled by persons in that age group in all professional and technical occupations.

Employment, 1980[1]	885,000		
Projected employment, 1990	1,093,000	–	1,176,000
Percent change, 1980-90	23.4	–	32.9
Average annual openings, 1980-90	168,000	–	183,000
Growth	21,000	–	29,000
Replacement	147,000	–	154,000

[1] Includes broadcast technicians, civil engineering technicians, electrical and electronic technicians, industrial engineering technicians, mechanical engineering technicians, and all other engineering and science technicians.

Engineers

Training. A bachelor's degree in engineering is required for most positions. Graduate training in engineering is important for a number of jobs, and is essential for college and university faculty positions. Persons having experience in other technical jobs or degrees in the natural sciences or mathematics also may qualify for some engineering jobs.

Employment patterns. Employment opportunities for those with degrees in engineering are expected to be good through the 1980's; new graduates should be particularly in demand. Between 120,000 and 136,000 job openings are projected annually. Replacement needs are expected to account for about three-fourths of these openings as employers replace engineers who transfer to other occupations or stop working. About one-fourth of the projected openings are expected to result from faster than average growth as investment in industrial plants and equipment grows and defense spending rises sharply.

Even though the number of engineers expected to leave the occupation is large, the rate of movement out of engineering—about 6 percent leave annually—is less than half the rate for all occupations and is somewhat less than that for all professional and technical workers. Engineers are only slightly less likely to transfer to other occupations or become unemployed than are professional and technical workers in general, but are much less likely to leave the labor force to attend school or for household responsibilities. Most engineers who leave the labor force are 55 or older.

During 1980, about 44 percent of those who entered engineering were recent engineering graduates. Most of the other entrants transferred from other occupations—most likely people with previous experience or training in engineering or a related occupation. Some entrants were recent science and mathematics graduates, immigrant engineers, and persons over 55 who had not worked the previous year.

The National Center for Education Statistics projects that an average of about 74,000 bachelor's degrees in engineering and engineering technology will be awarded annually over the 1980-90 period. If entry rates observed during the 1970's—averaging about 80 percent—continue, roughly 60,000 new engineering graduates can be expected to seek engineering jobs annually. In the past, almost all recent engineering graduates who sought jobs received offers because they are preferred by employers for many engineering jobs. This preference is not likely to change during the 1980's, so all available recent engineering graduates, about 60,000 annually, are expected to find engineering jobs. As a result, between 44 and 50 percent of the projected 120,000 to 136,000 job openings during the 1980's would be filled by those graduates—compared to 44 percent in 1980.

Employment, 1980[1]	1,218,000		
Projected employment, 1990	1,552,000	–	1,672,000
Percent change, 1980-90	27.4	–	37.3
Average annual openings, 1980-90	120,000	–	136,000
Growth	33,000	–	46,000
Replacement	87,000	–	90,000

[1] Includes engineers and an estimate for college engineering teachers based on data from the National Science Foundation.

Insurance agents and brokers

Training. Employers of insurance agents prefer college graduates but readily accept individuals with some college courses or with less than a 4-year degree. Some employers hire high school graduates with potential or proven sales ability or those who have demonstrated success in other types of work.

Agents and brokers must have a license in the State where they plan to sell insurance. In most States, licenses are issued to applicants who pass written examinations covering insurance fundamentals and the State's insurance laws. New agents usually receive training at their local agency and also at the insurance company's

home office. Some attend company-sponsored classes to prepare for examinations; other study on their own.

Employment patterns. Employment opportunities for insurance agents and brokers are expected to be good through the 1980's. The volume of insurance sales should continue to expand as an increasing number of people enter the 25-54 age category—the group with the greatest insurance needs. Employment growth due to increased sales and the need to replace people who leave the occupation are projected to create between 46,000 and 49,000 job openings annually during the 1980's. Although replacement needs are expected to account for 85 percent of all openings, they are a somewhat less significant source of job openings than in most other sales occupations.

Insurance agents and brokers are less likely to leave their occupation than other sales workers. Their separation rate—13 percent—is almost as low as that for professional or managerial workers. Those who left the occupation during 1980 exhibited a greater than average tendency to transfer to other occupations—nearly 60 percent moved to other jobs compared to less than one-half of all workers. The rest stopped working. Most left the labor force primarily to assume household duties or retire. Relatively few became unemployed.

Data for 1980 indicate that this occupation tends to attract people with previous work experience who are older and better educated than average. Three-fourths of all jobs for insurance agents and brokers were filled by people who transferred from other occupations, compared to less than half for all job openings. Two-thirds of those entering this occupation in 1980 were 25 years or older compared to one-half of all entrants. More than one-half of the job openings in this occupation were filled by people with at least some college education. Persons who took part-time positions as insurance agents and brokers tended to have less education than those who worked full time in 1980.

Employment, 1980	327,000		
Projected employment, 1990	399,000	–	420,000
Percent change, 1980-90	21.8	–	28.4
Average annual openings, 1980-90	46,000	–	49,000
Growth	7,000	–	9,000
Replacement	39,000	–	40,000

Kindergarten and elementary school teachers

Training. All States require teachers in public elementary schools to be certified; some States also require certification of teachers in private and parochial elementary schools. To become certified, an individual must have a bachelor's degree from an institution with a State-approved teacher education program, student teaching experience, and basic education courses. In 1980, almost half the States required teachers to obtain a master's degree within a certain period after beginning employment.

Employment patterns. Roughly 220,000 job openings for kindergarten and elementary school teachers are projected to be created annually during the 1980's due to employment growth and the need to replace experienced teachers who leave the profession. The demand for teachers is determined mainly by enrollments, which in turn depend on the school-age population. Based on Bureau of the Census projections of the population, the National Center for Education Statistics (NCES) projects that the downward trend for elementary school enrollments, which began in 1967, will halt around 1983. Thereafter, enrollments will rise through the 1980's. As a result, employment of kindergarten and elementary teachers is projected to increase about as fast as the average for all occupations over the decade. Some additional employment also may be created as a result of efforts to lower the pupil-teacher ratio. Nevertheless, replacement needs are expected to be the main source of jobs—accounting for almost 9 out of every 10 openings.

About 11 percent of all kindergarten and elementary school teachers left the occupation in 1980—about the same as the separation rate for all professional workers. Nearly one-half of all those who left kindergarten and elementary teaching did so to take up family responsibilities, compared to 22 percent for all professional workers. About one-third of all teachers in this field transferred to other occupations. Some retired; relatively few became unemployed or returned to school.

New degree receipients constitute an important source of teacher supply. The number of persons qualified to teach has declined in recent years because of the poor job market. In 1981, for example, only about 76,000 new graduates (about 8 percent of bachelor's degree recipients) were prepared to teach in elementary schools, down from more than 135,000 new graduates (about 15 percent of bachelor's degree recipients) in 1973. If the proportion prepared to teach remains at about 8 percent, an average of 78,000 new graduates will be prepared to teach in elementary schools each year during the 1980's, based on the latest NCES projections of earned degrees. If the application rate for 1981—about 85 percent—continues, about 66,000 are likely to seek teaching positions.

Most kindergarten and elementary school teachers are women. The occupation is characterized by a pattern of movement from teaching to family responsibilities or other work and back to teaching again. Thus, at any time, there is a large reserve pool of qualified teachers not in the labor force. In 1980, 37 percent of those who obtained teaching jobs had not worked the previous year because of household responsibilities. In addition, kindergarten and elementary school teachers have been in oversupply for years, so that many

would-be teachers took other jobs until they were able to obtain a teaching job. In 1980, 41 percent of entrants into kindergarten or elementary school teaching transferred from other jobs (some probably were recent graduates employed while in school).

The number of persons in the reserve pool who will seek teaching jobs in the future cannot be estimated—it depends on factors such as the availability of teaching jobs and the salary level relative to other jobs. Nevertheless, job prospects for kindergarten and elementary school teachers are expected to improve after 1983 as enrollments increase. Shortages could develop if the proportion of bachelor's degree recipients prepared to teach continues to decline, or if the number of persons from the reserve pool of teachers seeking entry to the field is insufficient.

Employment, 1980[1]	1,625,000		
Projected employment, 1990	1,919,000	–	1,931,000
Percent change, 1980-90	18.1	–	18.8
Average annual openings, 1980-90	217,000	–	218,900
Growth	29,400	–	30,600
Replacement	187,600	–	188,300

[1] Includes salaried elementary school teachers and preschool and kindergarten teachers in the educational services industry.

Lawyers

Training. To practice law in any State, a person must be admitted to its bar. Usually, applicants for admission to the bar must pass a written examination. To qualify for the examination in most States, an applicant must complete at least 3 years of college and graduate from law school. Lawyers who have been admitted to the bar in one State sometimes may be admitted in another State without taking the bar examination, although requirements may vary.

Employment patterns. Employment of lawyers grew very rapidly during the late 1970's. While growth is projected to be faster than the average for all occupations through the 1980's as the demand for legal services expands, employment growth is expected to create fewer annual job openings for lawyers than during the former period. The need to replace lawyers who retire or leave their jobs for other reasons is expected to account for about two-thirds of the 34,000 to 41,000 average annual job openings projected over the 1980-90 period. Still, replacement needs play a less significant role as a source of job openings for lawyers than for most occupations.

During 1980, less than 5 percent of employed lawyers left the occupation. While most lawyers who left the occupation transferred to another job, the rate of transfer out of this occupation was about one-half the rate for all professional and technical workers. Lawyers are less inclined to change their occupation, since they have invested substantial amounts of time and money in training. Those lawyers who do transfer often take administrative, managerial, business, or political positions, and some become judges. Most of the other lawyers who left the occupation during 1980 retired or returned to school. Some assumed household duties; relatively few became unemployed.

The vast majority of job openings are filled by recent law school graduates. Most of these graduates are in their mid- to late 20's and have little or no work experience. About 35,600 persons earned law degrees during academic year 1979-80, according to the National Center for Education Statistics.

During 1980, about one-fifth of the job openings for lawyers were filled by persons who transferred into the occupation. This was less than one-half the proportion of openings that were filled by transfer in all professional and technical occupations. Some of those who transfer into the legal profession also are new graduates who have attended law school on a part-time basis while working full time in other occupations. Data from the American Bar Association show that law schools have graduated about 5,000 part-time students annually in recent years.

Others who transferred included law school graduates who were reentering the profession and those who had no previous work experience as lawyers. Many of these persons used their law degrees to pursue careers in business, politics, and other fields in which a thorough knowledge of law is invaluable. Some graduates, in the midst of keen job competition, were unable to find jobs as lawyers shortly after graduation from law school. Rather than establish a new law practice, they accepted jobs in other fields where legal training is an asset but not normally a requirement. These groups make up a reserve pool of qualified lawyers who can enter this job market at any time.

Despite strong growth in the demand for lawyers during the late 1970's, the sizable number of law school graduates entering the job market each year has created keen competition for salaried jobs. Employment growth is projected to slow during the 1980's. While the number of graduates is expected to level off during this period, the supply of new graduates seeking jobs as lawyers each year, coupled with those qualified lawyers seeking to transfer into the legal profession, is expected to result in continued intense competition for jobs. This should be especially true in large metropolitan areas. Graduates of prestigious law schools and those who rank in the top of their classes should have the best job opportunities. In this competitive job market, the willingness to relocate also should be an advantage in getting a job.

While establishing a new law practice is always possible, those who undertake this venture may find it difficult to compete with established law firms. Prospects probably will continue to be best in those small towns

and expanding suburban areas in which an active market for legal services already exists.

Employment, 1980[1]	425,000		
Projected employment, 1990	532,000	–	588,000
Percent change, 1980-90	25.3	–	38.6
Average annual openings, 1980-90	34,000	–	41,000
Growth	11,000	–	16,000
Replacement	23,000	–	25,000

[1] Includes lawyers and an estimate for law school faculty based on data from the American Bar Association.

Librarians

Training. Entry requirements for librarians vary by employment setting. Most States require that school librarians be certified as teachers. A library degree may not be required because the library has become the "learning resources center" in many schools and is staffed by those with master's degrees in media resources, educational technology, and audio-visual communications, or with bachelor's or master's degrees in library science. A master's degree in library science (MLS) is usually required for jobs in public libraries and most college and university libraries. Some States require certification of public librarians; the specific education and experience required vary. A Ph.D. degree in library science is advantageous for teaching in library schools or for a top administrative post in a college or university library or in a large library system.

Employment patterns. Approximately 21,000 job openings are projected to become available annually during the 1980's. Virtually all openings are expected to arise from the need to replace librarians who stop working or transfer to other occupations, since employment growth is projected to be very slow through the 1980's. Employment growth in public libraries is likely to be slower than it has been in the last two decades, while little change is foreseen in school library employment and employment of academic librarians is expected to decline slightly. Opportunities are expected to be best for librarians with specialized knowledge in scientific and technical fields, including medicine, law, engineering, and the physical and biological sciences.

During 1980, about 15 percent of all librarians left the occupation. This separation rate was somewhat higher than the average for all other professional workers, primarily because librarians left the labor force at a higher rate; they were about as likely as other professional workers to transfer to other occupations or become unemployed. Of those who left the occupation, about one-third transferred to another occupation, about one-fourth left the labor force to take up household responsibilities, and the rest became unemployed, returned to school, or retired.

One source of entrants is new graduates with master's degrees in library science (MLS). About 5,300 MLS's were awarded in 1980, down from about 8,000 annually in the mid-1970's. This decline probably reflects the response of students to the poor job market for librarians. Furthermore, not all become librarians right after graduation. Only about half of the 1976-77 MLS recipients were employed as librarians in February 1978, according to a survey by the National Center for Education Statistics. Most entrants come from the pool of those qualified to be librarians who are not in the occupation. Nearly half of those who entered the occupation in 1980 had not been in the labor force the previous year because of household responsibilities. Most of the others transferred from other occupations, although some probably were recent library science graduates employed in other occupations while in school.

Employment, 1980[1]	145,000		
Projected employment, 1990	149,000	–	151,000
Percent change, 1980-90	2.6	–	4.5
Average annual openings, 1980-90	20,700	–	21,200
Growth	400	–	700
Replacement	20,300	–	20,500

[1] Includes librarians and audiovisual specialists.

Licensed practical nurses

Training. All States require practical nurses to have a license. To become licensed, applicants must complete a State-approved program in practical nursing and pass a written examination. Educational requirements for enrollment in State-approved training programs range from completion of eighth grade to high school graduation, but a high school diploma is usually preferred. Generally, the course lasts 1 year and is given in community and junior colleges, local hospitals, and vocational schools.

Employment patterns. Job prospects for licensed practical nurses (LPN's) should be good throughout the 1980's in view of the large number of job openings anticipated. About 115,000 LPN jobs are projected each year during the 1980-90 period as a result of faster than average employment growth and the need to replace experienced nurses who leave the occupation. Replacement needs are expected to account for the majority of LPN job openings—nearly 4 out of 5. Nonetheless, replacement needs account for proportionally fewer job openings in practical nursing than in other service occupations, or in the economy as a whole.

LPN's show an unusually strong attachment to their field: In 1980 they were three times less likely than all other workers to change occupations. They were much less likely than other service workers to transfer to another occupation or become unemployed. This may be associated with continuing high levels of demand for LPN's as well as limited opportunities for movement

into other health careers; entry requirements in the health field are such that experience cannot as a rule substitute for completion of a prescribed course of training.

Of those who did leave nursing, about 7 out of 10 left the labor force altogether—generally to attend to family responsibilities. Licensed practical nurses not currently active in the field form a reserve pool of individuals qualified to reenter later on. Many do—the occupation is characterized by movement from homemaking into the labor force and out again. In 1980, an estimated 150,000 LPN's were not working in the field.

Entrants to practical nursing do not fit the pattern for the rest of the labor force. For the economy as a whole, just over half of those who entered an occupation during 1980 had not worked the year before and the rest had transferred from another occupation. In practical nursing, however, 4 out of 5 entrants had not been employed the previous year (most had been homemakers or students) and only 1 in 5 had transferred from another occupation. Some of the latter were most likely students who held other jobs while completing their training.

The very high percentage of new LPN's who had not been employed the previous year reflects the movement of mature women into and out of the occupation. Practical nursing attracts many middle-aged and older women, and this distinguishes it from other service occupations (except private household jobs). People age 35 and older filled more than 50 percent of the openings for practical nurses in 1980, but only 20 percent of all openings for service workers. Conversely, compared to other fields, relatively few teenagers and young adults enter practical nursing. Individuals age 16-24 filled only about 20 percent of the LPN job openings in 1980, compared to 60 percent of all service openings.

About 42,000 persons graduated from practical nurse training programs in 1980, according to the National League for Nursing, and almost 90 percent of them entered the occupation. New graduates filled approximately 2 out of 5 openings for practical nurses that year. If the number of new graduates declines for the remainder of the decade, as anticipated by the Bureau of Health Professions, new graduates will fill a smaller proportion of job openings than they do today.

Employment, 1980[1]	550,000
Projected employment, 1990[1]	782,000
Percent change, 1980-90	42.4
Average annual openings, 1980-90	115,000
Growth	22,000
Replacement	93,000

[1] Current employment estimate furnished by the Bureau of Health Professions; projection developed by BLS outside the framework of the OES matrix.

Machine tool operators

Training. Most machine tool operators learn their skills on the job. Beginners usually start by observing experienced operators at work, and gradually assume more responsibility as they gain experience.

Individual ability and effort largely determine the time required to become a machine tool operator. Most semiskilled operators learn their jobs in a few months, but becoming a skilled operator often requires 1 to 2 years. Some companies have formal training programs for new employees.

Although no special education is required for semiskilled jobs, persons seeking such work can improve their opportunities by completing courses in mathematics and blueprint reading. In hiring beginners, employers often look for persons with mechanical aptitude and some experience in working with machinery. Physical stamina is important since much time is spent standing. Applicants should be able to work independently.

Employment patterns. Job opportunities for machine tool operators should be plentiful through the 1980's in view of the large number of projected job openings—nearly 160,000 annually. Growth in the employment of machine tool operators is projected to be about the same as the average for all occupations as metalworking industries expand their output. However, the need fo replace experienced operators who transfer to other jobs or stop working is expected to account for about 9 out of 10 jobs.

Twenty-five percent of all machine tool operators left their jobs in 1980, about the same as for all nontransport equipment operatives. Over two-fifths of them transferred to other jobs. Some operators advanced to highly skilled machining occupations such as all-round machinist or tool-and-die maker or to jobs in machine programming and maintenance. Other operators probably transferred to other skilled or semiskilled occupations. One-third of all machine tool operators who left their jobs became unemployed—reflecting the occupation's sensitivity to the business cycle. Nearly one-fourth left the labor force altogether; four-tenths of these operators were retirees—age 55 and older.

Over half of all job openings for machine tool operators in 1980 were filled by persons who transferred into the occupation—most likely from unskilled or semiskilled occupations. This was slightly higher than the proportion of openings in other operative occupations filled by transfer. Nearly three-fourths of those who transferred into this occupation were 25-54 years old. In comparison, for all operative occupations except transport, half of those who transferred were in this age group.

Persons who had not worked the previous year filled nearly half of all openings for machine tool operators

in 1980. Over half of these operators had been unemployed and one-fourth had left household responsibilities or had been in school. Of all machine tool operators who had not worked the previous year, over half were 16-24 years old. Eighty-five percent of all machine tool operators who had not worked the previous year had a high school education or less. Roughly equal numbers had some formal postsecondary education or were college graduates.

Employment, 1980[1]	1,020,000		
Projected employment, 1990	1,205,000	–	1,233,000
Percent change, 1980-90	18.3	–	21.1
Average annual openings, 1980-90	155,000	–	159,000
Growth	19,000	–	21,000
Replacement	136,000	–	138,000

[1] Includes drill press and boring machine operators; grinding and abrading machine operators, metal; lathe machine operators, metal; machine tool operators, combination; machine tool operators, numerical control; machine tool operators, tool room; milling and planing machine operators; power brake and bending machine operators, metal; punch press operators, metal; wood machinists; shaper and router operators; lathe operators, wood; glass blowing lathe operators; lathe operators, grinding wheels; jewel bearing lathe operators; veneer lathe operators; boring machine operators, wood; power press tenders; punch press operators, plastics; incising machine operators; envelope finishing machine operators; drill punch operators; drillers, machine; and stone drillers.

Manufacturers' sales workers

Training. Manufacturing firms increasingly are seeking college graduates or individuals with at least some college education for sales positions. Manufacturers of nontechnical products look for business administration or liberal arts graduates; manufacturers of technical products usually seek graduates with degrees in science or engineering. Many employers also hire high school graduates with potential or proven sales ability or with demonstrated success in other types of work.

Many companies, especially manufacturers of technical products, have formal training programs for beginning sales workers that last at least 2 years. In some programs, trainees rotate among jobs to learn about production, installation, and distribution of the product. In others, trainees receive classroom instruction and on-the-job training under the supervision of a field sales manager.

Employment patterns. Employment opportunities for manufacturers' sales workers are expected to be good through the 1980's. Employment is projected to grow about as fast as the average for all occupations. Employment growth and the need to replace experienced workers who leave their jobs are projected to create between 71,000 and 78,000 job openings annually during the 1980's. Replacement needs are expected to be the main source of openings, however, accounting for 9 out of 10 job openings.

In 1980, about 15 percent of manufacturers' sales workers left the occupation—less than the proportion for all sales workers combined, but about the same as for wholesale trade sales workers. Of those who left, a greater proportion than average—68 percent—transferred to other jobs. Relatively few manufacturers' sales workers leave the labor force or become unemployed.

In 1980, 54 percent of the job openings for manufacturers' sales workers were filled by persons who transferred from other occupations; the rest were filled by those who were unemployed or previously outside the labor force. Those who transferred tended to be older and better educated than entrants who had not worked during the previous year. Manufacturers' sales work is popular with older individuals who are interested in making a career change. Individuals who were age 25 or older filled almost 8 out of 10 job openings in this occupation, compared to only a little more than one-half of all jobs openings. More than half of the openings in this occupation were filled by persons with at least some college education.

Employment, 1980[1]	437,000		
Projected employment, 1990	501,000	–	543,000
Percent change, 1980-90	14.5	–	24.1
Average annual openings, 1980-90	71,000	–	78,000
Growth	7,000	–	11,000
Replacement	64,000	–	67,000

[1] Includes sales workers in manufacturing industries.

Physicians

Training. All States require a license for the practice of medicine. Applicants must graduate from an accredited medical school; serve a 1- or 2-year residency after earning the M.D.; and pass a licensing examination. The licensing examination taken by most graduates of U.S. medical schools is the National Board of Medical Examiners (NBME) test that is accepted by all States except Texas and Louisiana. Graduates of foreign medical schools as well as graduates of U.S. medical schools who have not taken the NBME test must take the Federation Licensure Examination (FLEX) that is accepted by all jurisdictions. Although physicians licensed in one State usually can get a license to practice in another without further examination, some States limit this reciprocity.

Most physicians specialize in a particular field of medicine. Advanced training following the residency continues for 2 years or more and is offered in 38 specialties including internal medicine, general surgery, obstetrics and gynecology, psychiatry, pediatrics, radiology, anesthesiology, ophthalmology, pathology, and orthopedic surgery. The most rapidly growing specialties are in the primary care area—family practice, interna medicine, and pediatrics. Upon completion of the advanced training program and a period of clinical prac

tice, applicants for specialty board certification take the appropriate examination.

Employment patterns. Faster than average employment growth and the need to replace physicians who leave the medical profession are projected to create approximately 17,500 job openings each year during the 1980-90 period. The need to replace those who stop working or transfer to other occupations is expected to account for one-third of these openings. In comparison, replacements will account for nine-tenths of projected job openings for the work force as a whole.

Physicians exhibit very strong attachment to work and to the medical profession. Once having completed their training and entered medical practice, physicians tend to remain in the labor force until they retire. Moreover, relatively few leave medicine for other careers. Nearly 99 percent of all physicians who were employed at the beginning of 1980 were still active in medicine a year later. Comparable estimates of occupational attachment were 80 percent for all workers and 89 percent for professional and technical workers.

Recent medical school graduates constitute the principal source of supply of new physicians. Since licensure and specialty board certification take 10 to 15 years or more following graduation from high school, job openings for physicians are filled almost exclusively by persons age 25-34. Some jobs are filled each year by older entrants, including licensed physicians who had left the civilian labor force temporarily because of military service, disability, or household responsibilities.

Medical school enrollments have increased greatly since the mid-1960's; the sharpest rise occurred between 1965 and 1975. Enrollment increases have moderated since the mid-1970's, and relatively little change in the number of new graduates is foreseen for the decade of the 1980's. Foreign-trained physicians (including U.S. citizens who completed their training abroad) currently account for approximately one-sixth of all newly licensed physicians and one-fifth of all M.D.'s in practice. The number of foreign medical graduates practicing medicine in the United States has soared during the past few decades but this trend is not expected to continue. The Bureau of Health Professions anticipates that the supply of foreign-trained physicians will continue to grow during the 1980's, but more slowly than in the past.

Annual additions to the supply of physicians could range between 19,000 and 21,000, depending primarily on the rate of entry of foreign medical graduates. Future enrollment levels in U.S. medical schools can be projected with reasonable confidence, and the supply of licensed but inactive physicians is small. It is difficult, however, to predict immigration.

Job openings are projected to average about 17,500 a year. Evidence of oversupply in some regions and specialties is already evident, and supply/demand imbalances may intensify. Although primary care physicians who locate in areas where physicians are in demand should encounter little difficulty in establishing a practice, some specialists are expected to face an increasingly competitive market for the positions or locations of their choice. Pressure to curtail the influx of foreign medical graduates is likely to continue as the market adjusts to the increasingly abundant supply of physicians.

Employment, 1980[1]	405,000
Projected employment, 1990[1]	516,000
Percent change, 1980-90	27.4
Average annual openings, 1980-90	17,400
Growth	11,100
Replacement	6,300

[1] M.D.'s only. Current and projected employment estimates based on data furnished by the American Medical Association and the Bureau of Health Professions.

Plumbers and pipefitters

Training. Plumbers and pipefitters learn their skills on the job. Many pick up the trade by working as helpers to experienced plumbers and pipefitters; some receive more structured training from their employers; and some participate in formal apprenticeship programs administered by local union-management committees and local contractors' associations. Apprenticeship consists of 4 years of on-the-job training and a minimum of 216 hours of related classroom instruction each year. Some training authorities recommend completion of an apprenticeship because the program includes instruction in all the skills of the trade.

Employers prefer to hire high school graduates. High school or vocational school courses in shop, plumbing, general mathematics, drafting, blueprint reading, and physics provide a useful background.

Most local governments have licensing requirements for plumbers. To obtain a license, workers must pass an examination on the trade and local plumbing codes.

Employment patterns. Employment of plumbers and pipefitters is projected to grow about as fast as the average for all occupations through the 1980's as construction activity increases. Construction of oil refineries, chemical plants, powerplants, and other projects that have large, complex pipe systems is expected to increase demand for pipefitters. Similarly, construction of houses and other residential buildings is expected to increase the demand for plumbers. Between 52,000 and 57,000 job openings are projected to be available each year during the 1980's due to the increased demand for

plumbers and pipefitters and the need to replace experienced workers who stop working or transfer to other occupations. About 9 of 10 openings are expected to result from replacement needs.

Data on work experience in 1980 indicate that only about 3 percent of plumbers and pipefitters transferred to other occupations—less than one-half the proportion for other craft workers. Plumbers and pipefitters spend about 4 years acquiring their training and enjoy relatively high earnings. Consequently, they have a strong attachment to the occupation. Those who do transfer probably enter related jobs such as air-conditioning, heating, and refrigeration mechanic.

Most of the plumbers and pipefitters who left the occupation in 1980 stopped working. About one-fourth were older workers who retired. Most, however, were experienced workers who were between jobs. When work is not available or construction projects are completed, plumbers and pipefitters may become unemployed or leave the labor force temporarily. Most desire to reenter the trade when jobs become available and therefore reentrants are an important part of the labor supply for the occupation.

About 49,000 persons took jobs as plumbers and pipefitters during 1980. Six of every 10 jobs were filled by people who had not been working. Most were experienced plumbers and pipefitters who had been unemployed. Some had been in school; many were 16- to 19-year-olds who probably entered the occupation for the first time. A small proportion were older workers who had dropped out of the labor force temporarily.

Four jobs in 10 were filled by persons who transferred from other occupations. Some who transferred probably were experienced plumbers or pipefitters who had entered other occupations during periods when construction activity in their trade was down. Others were production workers who advanced to jobs as pipefitters in manufacturing plants. Some transferred from apprentice or helper jobs.

People entering the occupation for the first time can expect competition despite the large number of projected openings. Many people are attracted to the plumbing and pipefitting trade because of potential high earnings. Also, because of the temporary nature of construction work, there usually is a pool of experienced plumbers and pipefitters who are unemployed or outside the labor force. People planning to pursue this trade can improve their chances of steady work by acquiring all-round skills.

Employment, 1980	407,000		
Projected employment, 1990	489,000	–	522,000
Percent change, 1980-90	20.0	–	28.3
Average annual openings, 1980-90	52,000	–	57,000
Growth	8,000	–	12,000
Replacement	44,000	–	45,000

Printing press operators and assistants

Training. Most press operators learn their trade through apprenticeship programs, beginning as helpers to experienced press operators. Others obtain their skills through a combination of work experience and vocational or technical school training.

The length and content of training depend largely on the kind of press used in the plant. Most press operators are trained to operate more than one press but specialize in a particular area of printing such as letterpress, lithography, or gravure. The apprenticeship period in commercial shops generally is 2 years for press assistants and 4 years for press operators. In addition to on-the-job instruction, the apprenticeship includes related classroom or correspondence school courses. Courses in printing provide a good background. Because of technical developments in the printing industry, courses in chemistry, electronics, and physics also are helpful.

Employment patterns. Printing press operators are likely to face competition for jobs during the 1980's. The number of applicants to apprenticeship programs is expected to exceed the number of openings. As a result, most people probably will have to take jobs as helpers or unskilled laborers before being selected for an apprenticeship. Web-press operators should have the best job prospects as many firms switch to web-offset presses from letterpresses or sheet-fed presses.

An estimated 25,000-28,000 job openings are projected annually through the 1980's. The need to replace printing press operators who retire or leave their jobs for other reasons is expected to account for about 90 percent of these openings—about the same proportion as for all occupations combined. The remaining openings are expected to result from employment growth, which, however, will be relatively slow as the increased use of faster and more efficient presses partially offsets the need for more press operators arising from growth in the amount of printed materials.

During 1980, about 16 percent of all printing press operators left the occupation—the same proportion as for all craft workers combined. Nearly two-thirds of these operators transferred to other jobs—most likely to other skilled or semiskilled occupations. Another one-fourth left the labor force—about half were retirees, age 55 and older.

During 1980, over 60 percent of all job openings for printing press operators were filled by persons who transferred into the occupation, compared to slightly over 50 percent for all craft workers combined. Many persons work as helpers or unskilled laborers before being selected for an apprenticeship. Others may transfer from declining printing occupations such as compositors and typesetters or electrotypers and stereo-

typers. Nearly 40 percent of the openings in 1980 were filled by persons who had not worked the previous year. Over one-half of these persons had been unemployed and over one-fourth had been in school.

Persons with a high school education or less filled over 60 percent of the jobs for printing press operators in 1980. However, less than 10 percent of the jobs were filled by persons 16-19 years old—indicating that very few individuals enter this occupation immediately after completing high school. Persons with some college or postsecondary training filled over one-fourth of the openings; college graduates filled less than 10 percent of the jobs.

Employment, 1980[1]	178,000		
Projected employment, 1990	194,000	–	208,000
Percent change, 1980-90	9.0	–	16.9
Average annual openings, 1980-90	25,500	–	27,900
Growth	1,600	–	3,000
Replacement	23,900	–	24,900

[1] Includes letter press operators, offset lithographic press operators, platemakers, press operators and plate printers, and all other press and plate printers.

Programmers

Training. In hiring programmers, employers look for people who can think logically and are capable of exacting analytical work. Employers using computers for scientific or engineering applications prefer college graduates who have degrees in computer or information science, mathematics, engineering, or the physical sciences. Graduate degrees are required for some jobs. Although some employers who use computers for business applications do not require college degrees, they prefer applicants who have had college courses in data processing.

Employment patterns. Employment of programmers is projected to grow faster than the average for all occupations through the 1980's as computer usage expands. Between 36,000 and 40,000 jobs are projected to be available each year due to the increased demand for programmers and the need to replace experienced workers who stop working or transfer to other occupations. Replacement needs are expected to account for about two-thirds of all job openings for programmers, a much lower proportion than the proportion for all professional and technical workers—86 percent. Job prospects for programmers should continue to be excellent for college graduates who have had computer-related courses, particularly for those with a major in computer science or a related field. Graduates of 2-year programs in data processing technologies also should have good prospects, primarily in business applications.

Data on work experience in 1980 indicate that programmers have a strong attachment to their occupation. Only 9 percent left the occupation in 1980, one-half the separation rate for all workers and somewhat less than the rate for all professional and technical workers.

Fifty-four percent of those who left the occupation transferred to a different job—probably systems analyst, data processing manager, or hardware or software sales worker. Forty-six percent of those who left the occupation stopped working. Most of these left the labor force—many assumed household responsibilities and others retired. Relatively few programmers became unemployed in 1980.

About 55 percent of all job openings for programmers in 1980 were filled by persons who had not worked the previous year. Most had been in school and were under 35 years of age. The remaining jobs were filled by workers who transferred from other occupations. Because of a shortage of trained programmers, many computer operators who completed additional training were able to advance to jobs as programmers. High wages in programming also have attracted other workers with appropriate skills, such as mathematics and physics teachers and engineers.

Employment, 1980	228,000		
Projected employment, 1990	340,000	–	366,000
Percent change, 1980-90	48.9	–	60.4
Average annual openings, 1980-90	36,000	–	40,000
Growth	11,000	–	14,000
Replacement	25,000	–	26,000

Psychologists

Training. A doctoral degree in psychology is required for the most responsible research, teaching, clinical, and counseling positions. Psychologists who want to establish an independent practice also must meet certification or licensing requirements. Licensing laws vary by State, but generally require a doctorate in psychology and 2 years of professional experience. In addition, most States require that an applicant pass a written and an oral examination. A master's degree in psychology may qualify individuals to work as psychological assistants, school psychologists or counselors, or to teach in 2-year colleges. Some States certify those with master's level training as psychological assistants or associates. Some States require continuing education for relicensure.

Employment patterns. Roughly 12,000 job openings for psychologists are projected to be created each year during the 1980's due to average employment growth and the need to replace psychologists who retire or leave their jobs for other reasons. Although replacement needs are expected to account for about 4 out of 5 openings, they are a less significant source of job openings than in most other occupations.

Persons holding doctorates in applied areas such as clinical, counseling, and industrial or organizational psychology should have more favorable job prospects than

those trained in research specialties such as experimental, physiological, and comparative psychology. Psychologists with extensive training in quantitative research methods and computer science should have a competitive edge over applicants without this background. Competition for academic positions is expected to remain keen. Persons with only a master's degree will probably continue to encounter severe competition for the limited number of jobs for which they qualify.

Data on the experience of workers in 1980 indicate that psychologists have a strong attachment to their occupation. Less than 8 percent left the occupation, compared with about 11 percent of all professional and technical workers and 20 percent of all workers combined. The rate of transfer out of this occupation was slightly over half the rate for all professional and technical workers, perhaps reflecting the substantial amount of time and money psychologists invest in training. Of those psychologists who left the occupation but did not transfer to another occupation, over half attended school or assumed household duties; the others retired or became unemployed.

In 1980, over 60 percent of the job openings for psychologists were filled by persons who were 35-54 years old—three times the proportion of openings for all professional and technical workers filled by persons in that age group. Many qualified psychologists enter or reenter the occupation after pursuing academic, business, and other careers, while other persons in this age group enter the field after earning an advanced degree in psychology. According to the National Center for Education Statistics, about 7,800 master's and 2,800 doctor's degrees were awarded in psychology in academic year 1979-80.

Roughly half of those who entered the occupation in 1980 transferred from other jobs—most likely persons who worked in another occupation while earning an advanced degree in psychology and those who reentered the occupation after pursuing other careers. Of the other half, some had been in school or had household responsibilities while others had been unemployed.

Employment, 1980[1]	106,000		
Projected employment, 1990	129,000	–	134,000
Percent change, 1980-90	22.3	–	26.7
Average annual openings, 1980-90	11,600	–	12,200
Growth	2,400	–	2,800
Replacement	9,200	–	9,400

[1] Includes psychologists and an estimate for college psychology teachers based on data from the National Science Foundation.

Purchasing agents

Training. Although there are no universal educational requirements for an entry level job as a purchasing agent, most large organizations require a college degree. and prefer applicants with a master's degree in business administration or management. Companies that manufacture machinery or chemicals may prefer applicants with a background in engineering or science, while other companies hire business administration majors as trainees. Courses in purchasing, accounting, economics, and statistics are helpful. Familiarity with computers also is desirable.

Some small companies require a bachelor's degree; many others, however, hire graduates of associate degree programs in purchasing for entry level jobs. They also may promote purchasing clerks or technicians to purchasing agent.

Employment patterns. Employment of purchasing agents is projected to increase about as fast as the average for all occupations through the 1980's as manufacturing firms, other businesses, and government agencies seek to minimize costs associated with purchases of materials, supplies, equipment, and services.

Between 20,000 and 22,000 job openings are projected to be available each year during the 1980's due to the rising demand for purchasing agents and the need to replace experienced workers who stop working or transfer to other occupations. Although replacement needs are expected to account for about 8 of 10 job openings, they are less significant than for managers as a whole.

Purchasing agents have a relatively strong attachment to their occupation. During 1980, only about 10 percent of all purchasing agents left the occupation, of whom three-fifths transferred to other jobs. About one-fifth left the labor force; the rest became unemployed. Those who became unemployed tended to have the least education. Of those who left the labor force, 35 percent were persons 55 and older who probably retired; others took on family responsibilities and some returned to school.

Six of every 10 job openings for purchasing agents in 1980 were filled by workers who transferred from other occupations—probably clerical and technical workers in the purchasing department who moved up the career ladder and others whose specialized knowledge about particular products and services enabled tham to qualify for jobs as purchasing agents. The remaining openings were filled by unemployed purchasing agents and persons who returned to the labor force after having taken time off to care for a family, attend school, or for other reasons. Most persons in this category had some education beyond high school.

Employment, 1980	172,000		
Projected employment, 1990	200,000	–	214,000
Percent change, 1980-90	15.8	–	24.1
Average annual openings, 1980-90	20,000	–	22,000
Growth	2,500	–	4,000
Replacement	17,500	–	18,000

Radiologic technologists

Training. Completion of a formal training program in radiography, nuclear medicine technology, or radiation therapy technology is required for many entry level jobs. Hospitals, which employ about three-fourths of all radiologic technologists, prefer to hire individuals who have had formal training. Technologists employed in physicians' offices are likely to be trained on the job, however.

Training in radiologic technology is offered at the postsecondary level in hospitals, medical schools, colleges and universities, trade schools, vocational-technical institutes, and the Armed Forces. Formal training programs vary greatly, both in length and the level of skill they impart. They last from 1 to 4 years and lead to a certificate or an associate or bachelor's degree. A bachelor's or master's degree in radiologic technology is desirable for supervisory, administrative, or teaching positions. A small but growing number of States require radiologic technologists to be licensed.

Employment patterns. Faster than average employment growth and the need to replace radiologic technologists who leave the occupation are projected to create between 16,500 and 17,500 job openings each year during the 1980's. Demand for these workers is expected to rise as radiologic equipment is increasingly used to diagnose and treat disease. The use of nuclear medicine in diagnostic tests and radiation therapy for cancer treatment is expected to spur demand for technologists with specialized skills.

Despite the rapid increase in employment projected for the 1980's, approximately 3 out of 4 openings are expected to arise from the need to replace radiologic technologists who stop working or transfer to other occupations. About 10 percent of all radiologic technologists left their jobs in 1980. This was about average for a professional occupation. Most left the labor force—to go to school or assume household responsibilities, for the most part. Relatively few technologists transferred to another job or became unemployed.

Radiologic technologists are young and predominantly female. Most job entrants are in their 20's or early 30's and 7 of every 10 radiologic technologists are women. The field is, accordingly, characterized by a pattern of movement from family responsibilities into the labor force and back to the home again. Nearly half of those who took radiologic technologist jobs in 1980 worked part time, a significantly larger proportion than for professional and technical workers as a whole.

Recent graduates of formal training programs are an important source of supply. Other sources include radiologic technologists returning to the field from homemaking or other activities; people transferring from other occupations (many of them from other health occupations); and those trained in the Armed Forces. In 1980, three-quarters of those who entered the occupation were labor force entrants or reentrants. Some had been students the year before, but many others had been homemakers. Only about one-fourth transferred from other jobs, mainly from other allied health occupations. The proportion of radiologic technologists who transferred from other occupations was considerably smaller than that for all professional and technical workers or for the work force as a whole.

The Committee on Allied Health Education and Accreditation (CAHEA) of the American Medical Association accredits many, but not all, formal training programs for radiologic technologists. The number of graduates of CAHEA-accredited programs has tripled since 1965. A total of 8,720 persons graduated from CAHEA-accredited programs in 1980: 7,725 in radiography, 664 in nuclear medicine technology, and 331 in radiation therapy technology. Health professions analysts expect the number of graduates in radiography to stabilize at the current level for the rest of the 1980's, and completions in nuclear medicine technology and radiation therapy technology to rise considerably.

Employment, 1980[1]	106,000		
Projected employment, 1990	145,000	–	152,000
Percent change, 1980-90	35.8	–	42.7
Average annual openings, 1980-90	16,400	–	17,500
Growth	3,800	–	4,500
Replacement	12,600	–	13,000

[1] Includes radiologic and nuclear medicine technicians and X-ray technicians.

Real estate agents and brokers

Training. All States and the District of Columbia require real estate agents and brokers to be licensed. Prospective agents must be high school graduates, be at least 18 years old, and pass a written test. The examination—more comprehensive for brokers than for agents—includes questions on basic real estate transactions and on laws affecting the sale of property.

Most States require candidates for the general sales license to complete at least 30 hours of classroom instruction. Candidates for a broker's license must complete 90 hours of formal training and have 1 to 3 years of experience selling real estate. Some States waive the experience requirement for applicants who have a bachelor's degree in real estate.

Employment patterns. Employment of real estate agents and brokers is projected to rise faster than the average for all occupations through the 1980's in order to satisfy a growing demand for housing and other properties. Shifts in the age distribution of the population should result in a larger number of young adults with careers and family responsibilities. This is the most

geographically mobile group in our society and the one that traditionally makes the bulk of home purchases. As their incomes rise, these people also may be expected to purchase larger homes and vacation properties.

The large number of job openings for real estate agents and brokers should make it easy to get a job. Competition for sales is keen, however. Well-trained and ambitious people who enjoy selling should have the best prospects for a successful career in real estate.

Between 104,000 and 116,000 job openings are projected to be available each year through the 1980's due to the increased demand for real estate agents and brokers and the need to replace experienced workers who stop working or transfer to other occupations. About 8 of 10 job openings are expected to result from replacement needs, a somewhat smaller proportion than for all sales workers.

Data on work experience in 1980 indicate that real estate agents and brokers are more likely to remain in their occupation than are other workers. Eighty-five percent of agents and brokers remained in the occupation between 1980 and 1981, compared to 80 percent for all workers and 77 percent for other sales workers. Brokers generally have a greater investment in their career than agents and therefore may have a stronger attachment to the occupation. About one-half of those who left their jobs in 1980 left the labor force. Many of these had worked in the occupation part time, and left to resume household responsibilities, to retire, or to return to school.

About 44 percent of agents and brokers who left the occupation transferred to different occupations. This accounted for about 7 percent of all agents and brokers in 1980, slightly less than the average for all workers but substantially less than for all sales workers. Experience gained selling real estate enables these workers to move to other sales occupations, such as insurance or securities sales, or to the related fields of real estate appraisal, property management, and investment counseling. Agents who work for large firms may advance to managerial positions.

Relatively few real estate agents and brokers become unemployed; the proportion who lost their jobs in 1980 was less than one-fourth the proportion for all sales workers. Because agents are paid mainly by commission, they contribute relatively little to the firm's costs. In most cases, it is to the firm's advantage to keep agents working, even in a depressed market.

About 74,000 people took jobs as real estate agents and brokers in 1980. About 63 percent were labor force entrants or reentrants. Most of these were homemakers or retired persons. Because real estate agents generally determine their own work schedules, this occupation attracts many people with family responsibilities. Many of these people enter, leave, and subsequently reenter the occupation, depending on the strength of the housing market, family responsibilities, or other personal factors. About 2 of every 3 homemakers and retired persons who began selling real estate in 1980 worked part time. Persons who had been in school or were unemployed made up the remainder of the labor force entrants and reentrants.

Persons who transferred from other occupations accounted for about 37 percent of those who became agents and brokers in 1980. They came from a variety of occupations, such as other sales jobs, clerical jobs in real estate agencies, or from completely unrelated fields. About 1 of 6 who transferred took a part-time position.

Information on work experience in 1980 provides some evidence that a growing number of real estate agents or brokers are college graduates. One-third of all persons taking jobs as agents or brokers had a college degree. This was double the proportion of college graduates entering other sales jobs. Fewer than 2 percent of all entrants with a college degree came directly from school. About one-third of all graduates transferred into the occupation; the remainder were primarily college-educated homemakers and labor force returnees.

Employment, 1980[1]	582,000		
Projected employment, 1990[1]	779,000	–	852,000
Percent change, 1980-90	33.8	–	46.4
Average annual openings, 1980-90	104,000	–	116,000
Growth	20,000	–	27,000
Replacement	84,000	–	89,000

[1] Current employment estimate taken from the Current Population Survey. Projected employment calculated using growth rates implicit in the OES matrix.

Registered nurses

Training. To obtain the license to practice that is required by all States and the District of Columbia, nurses must graduate from an approved school of nursing and pass a national examination administered by each State. Nurses may be licensed in more than one State, either by examination or endorsement of a license issued by another State.

Nurse training programs vary in length from 2 to 5 years after graduation from high school, depending on the nature of the program. Programs offered by community and junior colleges take about 2 years and lead to an associate degree; hospital-based programs last 2-3 years and lead to a diploma; college and university programs require 4 or 5 years and lead to a baccalaureate degree. There is considerable controversy about the relative merits of the various nurse training programs. Some employers have specific preferences, but, with few exceptions, graduates of all of these programs qualify for entry level positions after passing the licensing examination.

Some RN's who receive their training in diploma or associate degree programs subsequently enter baccalaureate degree programs to prepare themselves for a broader scope of nursing practice. Experienced RN's may continue their training by enrolling in postbaccalaureate programs leading to advanced degrees or specialist certificates.

Employment patterns. Employment opportunities for RN's should be good throughout the 1980's in view of the many jobs that will be available. Between 180,000 and 190,000 job openings are projected to arise each year during the 1980's due to faster than average employment growth and the need to replace experienced nurses who leave the profession. Demand for nurses is expected to increase due to the health care needs of a growing and aging population. Advances in medical technology also should spur demand, for highly trained workers are needed for the sophisticated procedures and equipment used in diagnosis and treatment. Replacement needs are expected to account for 3 out of 4 openings for nurses each year, a much lower proportion than the average for all workers (9 out of 10).

In contrast to the popular impression of an exodus of nurses suffering from "burnout," data on the work experience of the population in 1980 portray an occupation of above-average stability. Attachment to the occupation is stronger in nursing than in many other fields requiring a comparable investment in training. Nearly 90 percent of all RN's who held nursing jobs at the beginning of 1980 were active in the profession a year later. This is comparable to the occupational stability of professional workers in general—and significantly greater than the stability demonstrated by the work force as a whole. The rate of occupational attachment of nurses resembles that of elementary and secondary school teachers, dental hygienists, and personnel workers, and exceeds that of librarians, social workers, and dietitians.

Although nurses change jobs from time to time—quitting one nursing job for a more attractive one elsewhere—relatively few transfer to non-nursing occupations. When nurses leave the profession, they tend to leave the labor force altogether. About 7 out of 10 nurses who stopped working in 1980 did so in order to assume household responsibilities. Nurses are much less likely than other professional and technical workers to transfer to another occupation or become unemployed.

In 1980, three-fourths of all entrants to nursing were in their 20's or early 30's. Nearly half were between 25 and 34 years of age, a much higher representation in this age group than average. Many of these were women entering or returning to nursing after a brief absence from the work force for family reasons. Nursing also is popular with mature women seeking a career; among students in associate degree programs, one fifth are 30 years of age or older.

About one-fourth of all job openings for nurses in 1980 were for part-time positions, approximately the same proportion of part-time openings as that for all professional and technical workers. In the economy as a whole, part-time workers filled one-third of all openings in 1980. Nurses from outside the labor force and especially those in the 25-34 year age bracket showed the most interest in part-time work, reflecting the movement of women with young children into the occupation.

Recent nursing school graduates are a major source of supply for the profession, but not the only one. During 1980, an estimated 130,000 people entered nursing. Approximately 70,000 of them, or somewhat more than half, were recent graduates of basic nursing education programs. Most of the others came from the large pool of RN's who maintain their licensure while staying at home to care for families. Also included in the reserve pool are licensed nurses employed in other occupations, and individuals who reinstate their licensure in order to go back to work.

Because of licensure requirements, relatively few people enter or reenter nursing from another occupation (the transfer-in rate for 1980 was about one-third that for all occupations.) Nonetheless, some movement into the occupation is to be expected from nurses who previously held other jobs in the health field as faculty members, community health educators, health researchers, administrators, or sales representatives for medical supply firms, for example.

Enrollments in nurse training programs rose substantially in the late 1960's and early 1970's and then leveled off. The number of graduates of initial programs has hovered at about 76,000-78,000 a year since 1976. The Bureau of Health Professions (BHP) projects that 65,000-75,000 newly qualified nurses will complete training programs each year during the 1980's. Actual completions could be either higher or lower, for enrollments appear to be associated with nurses' earnings relative to those in alternative occupations. Accordingly, if demand for nurses increases sufficiently to cause earnings to rise relative to those in other fields, nursing school enrollments would probably increase and training completions might surpass the levels currently anticipated. If training completions fall below current levels while demand for nurses grows, a larger proportion of job entrants will be drawn from the reserve pool of qualified nurses not currently working in the field.

Employment, 1980	1,104,000		
Projected employment, 1990	1,541,000	–	1,617,000
Percent change, 1980-90	39.6	–	46.5
Average annual openings, 1980-90	179,000	–	190,000
Growth	44,000	–	51,000
Replacement	135,000	–	139,000

Reporters and correspondents

Training. Most large employers prefer applicants who have a bachelor's degree in journalism. A major in news journalism is recommended for those seeking jobs with newspapers, magazines, and news wire services. An advanced degree in journalism is an asset for prestigious entry positions, such as those on large metropolitan newspapers. Many small-town and local newspapers hire individuals who have acquired journalism training in a junior or community college or in the Armed Forces.

Employment patterns. A relatively small number of job openings for reporters and correspondents—between 12,000 and 14,000—is expected each year during the 1980's. Some will arise as a result of growth in the number of small-town and suburban newspapers. Replacement needs, however, are expected to be the primary source of the jobs, accounting for 9 out of every 10 job openings—about the same proportion accounted for by replacements in all occupations combined.

During 1980, about 18 percent of all reporters and correspondents left their jobs, compared to only about 11 percent of all professional and technical workers. About one-half of them transferred to another occupation, such as public relations worker or radio and television newscaster. Another one-third left the labor force, primarily to return to school, assume household responsibilities, or retire. Others experienced unemployment as some newspapers and magazines went out of business.

About 55 percent of those who took jobs as reporters and correspondents in 1980 transferred from other jobs. Some, most likely, were persons who worked in other occupations while attending school. Others had expertise in specialized fields, such as finance or athletics, and had demonstrated that they were capable writers. Transfers were a more significant source of supply in this occupation than in all professional and technical occupations combined, where less than 50 percent of the job openings were filled by transfer.

About 45 percent of those who took jobs as reporters and correspondents in 1980 had not worked the previous year, the largest proportion of whom—three-fifths—had been in school. Some graduated from 4-year programs; others completed journalism programs in junior and community colleges. Still others took jobs after having been involved with family responsibilities.

Data from the National Center for Education Statistics indicate that about 8,500 bachelor's and 900 master's degrees were awarded in journalism in academic year 1979-80. Not all graduates seek careers in this field, however. On the other hand, many persons who are talented writers in other occupations and can handle scientific, technical, and other highly specialized subjects seek jobs as reporters and correspondents each year.

Newspapers and magazines located in small towns and suburban areas should provide the best opportunities for beginning reporters. Journalism graduates who are willing to relocate and start at relatively low salaries should have an edge in getting these kinds of positions. Persons without at least a bachelor's degree in journalism are expected to face increasingly stiff competition for entry level positions. Competition for reporting jobs on large metropolitan newspapers and national magazines probably will continue to be keen. Most of these positions require previous journalism experience.

Employment, 1980	57,000		
Projected employment, 1990	70,000	–	75,000
Percent change, 1980-90	22.2	–	31.7
Average annual openings, 1980-90	12,400	–	13,400
Growth	1,300	–	1,800
Replacement	11,100	–	11,600

Retail trade sales workers

Training. Most retail trade sales workers learn their skills on the job. In large stores, training for newly hired workers usually begins with several days of classroom instruction, followed by on-the-job training under the supervision of an experienced worker. In small stores, an experienced worker, or in some cases the proprietor, trains new sales workers. Employers prefer to hire high school graduates, and courses in commercial arithmetic and merchandising provide a good background. Thousands of high schools offer distributive education programs that allow students to work part time while taking courses in merchandising, accounting, and other aspects of retailing. Marketing and distribution are also taught in trade schools, vocational-technical institutes, and community and junior colleges.

Employment patterns. Employment of retail trade sales workers is projected to rise about as fast as the average for all occupations through the 1980's as the industry expands in response to a growing population and higher personal incomes. The number of openings in this large occupation is considerably greater than average: Between 1.2 and 1.3 million job openings are projected to arise each year during the 1980-90 period. More than 9 out of 10 of these openings are expected to result from a need to replace experienced workers who leave the occupation.

Retail sales jobs are easy to enter because education and experience requirements are minimal. Many of the jobs are part time. Students, homemakers, and retirees are among those attracted to the occupation because it is a ready source of supplemental income. Retail sales

work also can serve as a steppingstone to higher paying, more responsible jobs.

Data on the experience of workers in 1980 show that retail sales workers exhibited much less attachment to their jobs than the average. They left the labor force at a higher rate than average, primarily to become full-time homemakers or students. Retail sales workers also transferred to other occupations at a higher than average rate. (A smaller proportion than average became unemployed or stopped working because of retirement or disability.)

About one-third of those who entered this occupation during 1980 transferred from other jobs. The rest had not worked the year before, because they had been in school or occupied with household responsibilities, for the most part. Some had been unemployed. Those entering the occupation tend to be young; many are high school or college students. Sixty percent of those who took retail sales jobs in 1980 were under 25 years of age. By comparison, approximately 45 percent of all openings were filled by people age 16-24. Slightly more than half of the retail sales openings were filled by part-timers. People entering from outside the labor force, especially teenagers, were more likely to take part-time jobs, whereas people transferring from other occupations were more likely to take full-time positions.

Employment, 1980[1]	3,347,000		
Projected employment, 1990	3,985,000	-	4,261,000
Percent change, 1980-90	19.0	-	27.3
Average annual openings, 1980-90	1,199,000	-	1,269,000
Growth	64,000	-	91,000
Replacement	1,135,000	-	1,178,000

[1] Includes sales clerks and all other sales workers employed in the retail trade industry.

Secondary school teachers

Training. All States require public secondary school teachers to be certified; some States require certification for teachers in private and parochial schools as well. To become certified, an individual must have a bachelor's degree from an institution with a State-approved teacher education program, student teaching experience, and basic education courses. In 1980, almost half the States required teachers to obtain a master's degree within a certain period after beginnning employment.

Employment patterns. The demand for teachers is determined mainly by enrollments, which in turn depend on the school-age population. Based on Bureau of the Census projections of the population, the National Center for Education Statistics (NCES) projects that the decline in secondary school enrollments, which began in the mid-1970's, will continue through the 1980's. Consequently, all of the 107,000 job openings for secondary teachers projected annually are expected to result from the need to replace experienced teachers who stop working or transfer to other occupations.

In 1980, 9 percent of all secondary school teachers left the occupation. This separation rate is somewhat less than the rate for all professional workers. More than 40 percent transferred to other occupations; about 30 percent left the labor force to assume household responsibilities; the rest retired, became unemployed, or returned to school.

New degree recipients constitute an important source of teacher supply. The number qualified to teach in secondary schools has declined over the past decade, as college students responded to the poor job market. In 1981, only about 84,000 new graduates (about 9 percent of bachelor's degree recipients) were prepared to teach in secondary schools, down from about 195,000 (about 22 percent of bachelor's degree recipients) in 1972. If the proportion prepared to teach remains at about 9 percent, an average of 86,000 new graduates will be prepared to teach in secondary schools each year during the 1980's, based on the latest NCES projections of earned degrees. If the application rate for 1981—about 72 percent—continues, about 62,000 are likely to seek teaching positions.

New graduates are not the only jobseekers, however. Many entrants come from the large reserve pool that consists of persons qualified to teach secondary school who could not get a teaching job because of the oversupply which has existed for the last 10 years or so, and teachers who left the profession for family responsibilities or other reasons. Of the 122,000 who entered secondary school teaching in 1980, over 50,000 transferred from other occupations (although some—up to 15,000—of the transfers were new graduates who were employed while in college), and about 30,000 had not been working the previous year because of household responsibilities. Potentially, 140,000 entrants would be competing for the projected 107,000 annual openings in the 1980's if similar numbers attempt to transfer from other occupations or from outside the labor force in addition to the 62,000 who are projected to seek employment after obtaining their degrees. Since many schools may prefer to hire new graduates—who command lower salaries and whose training is more recent—fewer job opportunities are expected for persons who want to transfer into or reenter the field. Even new college graduates are expected to face keen competition for jobs through the decade. However, job prospects should be favorable in fields such as mathematics and natural sciences. Persons qualified to teach these subjects may be in short supply because of competition from business and industry. Teachers qualified in special education and bilingual education also may find favorable opportunities.

Employment, 1980	1,237,000		
Projected employment, 1990	1,059,000	-	1,066,000

Percent change, 1980-90	-14.4	-	-13.9
Average annual openings, 1980-90[1]	107,200	-	107,600
Decline	(-17,800)	-	(-17,200)
Replacement	107,200	-	107,600

[1] Data about the expected decline in employment are presented in parentheses for information only, since replacement needs are the sole source of openings. See appendix B.

Secretaries

Training. High school graduates qualify for most secretarial positions provided they have basic office skills. Secretaries must be proficient in typing and good at spelling, punctuation, grammar, and oral communication. Shorthand is necessary for some positions. Word processing experience is increasingly important and some employers require it. Others, however, provide word processing instruction to newly hired workers.

The skills needed for a secretarial job can be acquired in various ways. Although formal training or refresher courses are not essential for most jobs, training is an asset and may lead to higher paying jobs. Secretarial training ranges from high school vocational education programs that teach office practices, shorthand, and typing to 1- to 2-year programs in secretarial science offered by business schools, vocational-technical institutes, and community colleges.

In 1979-80, approximately 125,000 individuals completed public vocational education programs in secretarial science, nearly 45,000 completed business school programs, and 33,000 completed community or junior college programs. There is no way of estimating how many of these graduates sought secretarial positions, but it seems likely that many who completed postsecondary programs entered the field. The general office skills that high school programs provide are suitable for many different careers, however.

Employment patterns. Prospects for secretaries are expected to be good throughout the 1980's in view of the large number of jobs that are projected to be available and the relative ease of entry to the occupation. Openings for secretaries are projected to greatly exceed the number of openings in most other occupations. Between 575,000 and 620,000 jobs are projected to be created every year during the 1980's by relatively rapid expansion in employment and the need to replace experienced secretaries who leave the profession. Employment of secretaries is projected to grow at a faster than average rate as existing businesses expand and new ones are established. Replacement needs nevertheless are expected to be the primary source of secretarial jobs during the 1980's, accounting for nearly 9 out of 10 openings.

About 18 percent of all secretaries left the occupation in 1980, compared to 22 percent of all clerical workers who left their jobs. Approximately equal numbers transferred to other occupations or left the labor force altogether. Relatively few secretaries became unemployed. Of those who left the labor force in 1980, nearly 60 percent did so to take up household in responsibilities. This was about double the proportion who left their job for this reason among all occupations.

Two out of 5 people who took jobs as secretaries during 1980 transferred from another job, many from another clerical position such as typist, receptionist, stenographer, bank teller, bookkeeper, cashier, or statistical clerk. The proportion of job entrants who transferred from another occupation was about average.

Three out of 5 openings for secretaries were filled by people who had not worked the previous year. Some had been unemployed, and others had been in high school, business schoool, or college. Most, however, had been homemakers. Secretaries are predominantly female, and the occupation is characterized by a pattern of movement from family responsibilities into the labor force and back to the home again. Of those who took jobs as secretaries during 1980, individuals who had not worked the previous year because of household responsibilities outnumbered those who had been in school by roughly 3 to 1. People who took jobs as secretaries in 1980 also were more likely than average to be between 25 and 54 years of age, a time of life when people are most likely to be responsible for the care and financial support of children. One-third of those entering the occupation were 25-34 years of age and another one-fourth were age 35-54—a larger representation than the average for all occupations.

Individuals with some college education filled nearly 2 out of 5 secretarial job openings in 1980. Most of these had attended college for a year or more but had not graduated. The rest of the secretarial openings—more than 3 out of 5—were filled by people who had a high school education or less.

One-fourth of those who took secretarial jobs in 1980 worked part time. Individuals coming from outside the labor force exhibited more interest in a part-time schedule than those who transferred from another occupation. Women who combine parental and job responsibilities probably have a preference for a part-time schedule when they first return to work.

Employment, 1980	2,500,000		
Projected employment, 1990	3,200,000	-	3,400,000
Percent change, 1980-90	28.3	-	37.4
Average annual openings, 1980-90	575,000	-	618,000
Growth	70,000	-	92,000
Replacement	505,000	-	526,000

Sheet-metal workers

Training. Sheet-metal workers learn their skills on the job. An apprenticeship that combines classroom and on-the-job training is the best way to acquire sheet-metal

skills. On the job, apprentices get practical experience in all aspects of the trade. In the classroom, they study drafting, blueprint reading, trigonometry and geometry applicable to layout work, welding, and the principles of heating, air-conditioning, and ventilating systems.

A high school diploma may be required for entry into an apprenticeship program. Courses in trigonometry, geometry, mechanical drawing, and shop are useful.

Employment patterns. Employment of sheet-metal workers in construction is projected to increase about as fast as the average for all occupations through the 1980's. More sheet-metal workers should be needed to install air-conditioning and heating ductwork and other sheet-metal products in new buildings and to place new, more energy-efficient air-conditioning and heating systems in existing buildings. Installation of solar heating equipment also should increase the demand for sheet-metal workers.

Between 17,000 and 18,000 job openings are projected to be available each year through the 1980's due to the increased demand for sheet-metal workers and the need to replace experienced workers who stop working or transfer to other occupations. More than 8 of 10 job openings are expected to result from replacement needs, about the same as for all craft workers.

Thirteen percent of all sheet-metal workers left their jobs in 1980. About 6 of every 10 who left became unemployed or left the labor force. Temporary layoffs are common for sheet-metal workers in the construction industry because of fluctuations in the level of construction activity and slack periods between projects. Most of the sheet-metal workers who became unemployed were in their prime working years, age 25 to 54, who would be expected to find employment as soon as work picks up. Most of those who left the labor force altogether were retirees, 55 years and older.

About 4 of every 10 sheet-metal workers who left the trade transferred to other occupations, a substantially lower proportion than for other crafts. Because they have made a sizable investment in training and their wages are relatively high, sheet-metal workers usually have a strong attachment to the occupation. Those who change jobs probably move to related crafts, such as air-conditioning and heating repair. Some sheet-metal workers may take managerial or sales jobs with construction contractors.

About one-half of all those who took jobs as sheet-metal workers in 1980 transferred from other occupations. The rest were persons who had not been working the previous year, two-thirds of whom had been unemployed. The remainder were labor force entrants or reentrants, including young workers, age 16 to 24, who were entering the occupation from school and older, experienced sheet-metal workers who had previously left the labor force temporarily.

About two-thirds of all the entrants to sheet-metal work in 1980 had a high school degree or less education, a smaller proportion than for other craft occupations. The remainder had some postsecondary vocational training in sheet-metal work or a related field. Entrants from other occupations were much more likely to have had some college training than entrants who had not been working.

People wishing to enter sheet-metal apprenticeships are likely to experience keen competition for the limited number of available training positions. First-time entrants also are expected to face competition from experienced sheet-metal workers who are unemployed and from workers in related occupations who wish to enter the trade.

Employment, 1980[1]	108,000		
Projected employment, 1990	130,000	–	137,000
Percent change, 1980-90	19.6	–	26.1
Average annual openings, 1980-90	17,000	–	18,000
Growth	2,000	–	3,000
Replacement	15,000	–	15,000

[1] Includes only sheet-metal workers employed in the construction industry.

Social workers

Training. A bachelor's degree is the minimum requirement for most professional positions in this field. Besides the BSW (bachelor's in social work), undergraduate majors in psychology, sociology, and related fields satisfy hiring requirements in many social service agencies. A master's degree in social work (MSW) is generally required for positions in the mental health field; the MSW is almost always necessary for supervisory, administrative, or research positions. A doctorate in social work usually is required for teaching, and is desirable for some research and administrative jobs.

In 1981, 26 States had licensing or registration laws regarding social work practice and the use of professional titles. Usually, work experience, an examination, or both, are necessary for licensing or registration.

Employment patterns. Between 69,000 and 71,000 job openings are projected to be created each year during the 1980's because of employment growth and the need to replace experienced social workers who leave the profession. Employment of social workers is projected to grow at about the same rate as that for all occupations, reflecting public and private response to the social service needs of a growing and aging population. Replacement needs are expected to be the principal source of jobs, however, accounting for 9 out of 10 openings during the 1980's.

During 1980, approximately 15 percent of all social workers left the profession. This separation rate was somewhat higher than the rate for all professional

workers chiefly because of the high transfer rate. Over half of the social workers who left their jobs in 1980 transferred to another occupation. In some cases, this reflected normal career progression: Transfer from direct service (e.g., casework or community action) to administration (e.g., policy analyst, planner, or program coordinator) or promotion from a job as casework supervisor, for example, to one as agency administrator.

Nearly half of those who left social work during 1980 stopped working altogether. Some became unemployed, but most went back to school, assumed household responsibilities, or retired. Individuals in this group augment the pool of potential reentrants. Particularly likely to return to the profession were those who stopped working in order to study for an MSW, a step that is important for career advancement.

In 1980, approximately 30,000 individuals with a college education took jobs as social workers. Not quite half of them transferred from another occupation. Many came from other human service fields, such as personnel administration, therapy, psychology, recreation, teaching, and public administration. Others had previously held clerical or service jobs such as social welfare aide, interviewer, clerical supervisor, or nurse aide. Some of those, undoubtedly, were BSW or MSW students who worked part time while in school. The rest of the jobs filled by college graduates in 1980 were taken by people who had not worked the previous year because they had been unemployed or in school. Relatively few people entering social work in 1980 had previously been occupied with home and family responsibilities, despite the preponderance of women in the occupation.

The supply of new graduates with suitable credentials is very large. Approximately 13,000 persons earned BSW's in 1980 and 10,500 earned MSW's. Many of the former and most of the latter eventually obtained social work positions. In addition, about 35,000 bachelor's and master's degrees were awarded in closely related disciplines including law enforcement and corrections, park and recreation management, and public administration. Also qualified for social work positions were 1980 graduates with bachelor's degrees in psychology (42,000) and the social sciences (104,000).

Job search may involve spells of unemployment or the decision to take a job in an unrelated field. Followup data on new college graduates suggest that during the late 1970's, job search difficulties in the social service area were largely confined to those holding bachelor's degrees. Only 35 percent of college graduates who earned bachelor's degrees in social work and the helping professions in 1976-77 were employed as social workers 6 months after graduation, according to a survey conducted by the National Center for Education Statistics. Nearly half of the BSW's held nonprofessional jobs and about 10 percent were unemployed or in graduate school. By contrast, more than 90 percent of those who earned MSW's in 1976-77 were employed in professional or managerial jobs 6 months after graduation; fewer than 10 percent were in nonprofessional jobs, unemployed, or outside the labor force. Two-thirds of the MSW's reported that they were employed as social workers.

In view of the abundant supply of new college graduates and others with appropriate credentials, job prospects for social workers vary a great deal. Opportunities depend in part on academic credentials—whether or not an applicant has formal social work training, and preferably an MSW. Geographic location is also an important consideration, for competition is keen in cities where training programs for social workers abound, such as Boston and New York. This competition is certain to intensify if social service programs in those localities are cut back. At the same time, population growth in Sunbelt States is spurring expansion of social service programs there, and some isolated rural areas find it difficult to attract and retain qualified staff. The type of practice is another variable. Job prospects are expected to be most favorable during the 1980's in the health field, including mental health, and in services to the aging. Child welfare and school social work, by contrast, are likely to offer fewer oportunities than they have in the past.

Employment, 1980	345,000		
Projected employment, 1990	414,000	-	428,000
Percent change, 1980-90	20.0	-	24.1
Average annual openings, 1980-90	69,000	-	71,000
Growth	7,000	-	8,000
Replacement	62,000	-	63,000

Systems analysts

Training. College graduates generally are sought for jobs as systems analysts, and, for some of the more complex jobs, persons with graduate degrees are preferred. Employers usually want analysts with a background in accounting, business management, or economics for work in a business environment while a background in the physical sciences, mathematics, or engineering is preferred for work in scientifically oriented organizations. Many employers seek applicants who have a degree in computer science, information science, information systems, or data processing. Regardless of college major, employers look for people who are familiar with programming language. Courses in computer concepts, systems analysis, and data base management systems offer good preparation for a job in this field.

Employment patterns. Job prospects for systems analysts should be excellent through the 1980's. Employment of systems analysts is projected to grow much faster than the average for all workers as computer ca-

pabilities are increased and as new applications are found for computer technology. Between 28,000 and 31,000 job openings are expected to be available each year during the 1980's due to the rising demand for systems analysts and the need to replace experienced workers who stop working or transfer to other occupations. Replacement needs are expected to account for only about one-half of all openings for systems analysts, a much smaller proportion than for professional workers as a group.

Systems analysts have a relatively strong attachment to their occupation; only 5 percent left the occupation during 1980, compared to 12 percent for all professional workers. Most of those who left the occupation transferred to other jobs. The transfer-out rate—4 percent—was slightly lower than the rate for all professional workers. Those who transferred probably advanced to managerial postions or moved into engineering, computer sales, or other technical fields. Relatively few systems analysts left the labor force or became unemployed in 1980.

During 1980, 7 of 10 job openings for systems analysts were filled by workers who transferred from other occupations. Most probably were computer programmers moving up the career ladder. In many organizations, entry workers routinely begin as programmers and are promoted to analyst jobs as they gain experience and demonstrate talent. Persons who had not worked the previous year filled 3 of every 10 job openings for systems analysts.

Persons who transferred into the occupation, on average, tended to be older than entrants who had not worked the previous year. College graduates filled virtually all the job openings for systems analysts in 1980.

Employment, 1980	205,000		
Projected employment, 1990	343,000	-	368,000
Percent change, 1980-90	67.8	-	79.8
Average annual openings, 1980-90	28,000	-	31,000
Growth	14,000	-	16,000
Replacement	14,000	-	15,000

Television and radio service technicians

Training. Training in electronics generally is required to get an entry level job as a television and radio service technician. High schools, private vocational schools, and junior colleges offer training in telelvision and radio repair. Programs in these schools include subjects such as mathematics, physics, schematic reading, electricity, and hands-on work with television sets, radios, and other equipment. The training typically lasts from 1 to 2 years. The military services also offer training and work experience that are very useful in civilian electronics work.

New technicians usually begin by working in the shop or in the field under the supervision of an experienced worker. Large repair establishments may provide in-house training combined with home study to familiarize new workers with particular brands and models of equipment. A few television and radio service technicians complete 3- or 4-year formal apprenticeship programs.

Some States require radio and television technicians to be licensed. To obtain a license, applicants must pass an examination designed to test their knowledge of electronic circuits and components and their skill in the use of testing equipment.

Employment patterns. Employment of television and radio service technicians is projected to grow faster than the average for all occupations through the 1980's in response to the growing number of television sets, video games and disk players, tape recorders, and other home entertainment products. Greater use of electronic products for other purposes is also expected to spur demand in this occupation. For example closed circuit television is being increasingly used to monitor production processes in plants, to protect buildings, and to bring educational programs into classrooms. Nevertheless, the need to replace experienced technicians who transfer to other jobs or stop working is expected to account for over four-fifths of all openings during the 1980's, which are projected to average between 18,000 and 19,000 a year. Still, replacement needs are a less significant source of job openings than in most other occupations.

Nearly 19 percent of all television and radio service technicians left their jobs in 1980—about the same as the rate for all occupations combined, but slightly lower than the rate for other craft workers and mechanics and repairers. Three-fourths of them transferred to other occupations—much higher than the proportion who left their jobs for this reason among all craft workers and mechanics and repairers. Their background in electronics often qualifies television and radio service technicians for other occupations, including electronics technician, computer service technician, business machine repairer, appliance repairer, and broadcast technician. Nearly one-fifth of all technicians who left their jobs left the labor force altogether; nearly three-fifths were retirees—age 55 and older. Relatively few technicians became unemployed—perhaps reflecting the fact that technicians enjoy steady work as the demand for television and radio services continues even during economic downturns.

Similar to the experience of other craft workers and mechanics and repairers, over half of all job openings for television and radio service technicians in 1980 were filled by persons who transferred from other occupations—most likely from mechanic and repairer or other craft occupations. Eighty-four percent of those transferring were 25-54 years old, compared to only 60 per-

cent for all craft occupations combined. Four-fifths of those who transferred into this occupation had a high school education or less.

Less than half of the job openings for television and radio service technicians in 1980 were filled by persons who had not worked the previous year. Over half had been in school (almost all were 16-24 years old). In comparison, of all persons who entered craft occupations in 1980 and who had not worked the previous year, only 17 percent had been in school. Less than one-tenth of those who took jobs as television and radio service technicians in 1980 and who had not worked the previous year had left household responsibilities (all were 35-54 years old). This pattern reflects the very low proportion of women in this occupation—similar to other mechanics and repairers. Nine-tenths of those who took jobs as television and radio service technicians and who had not worked the previous year had a high school education or less. One-tenth had some formal postsecondary education.

Thirty-six percent of the job openings for television and radio service technicians in 1980 were part-time positions; only 13 percent of the openings in all craft occupations were part-time positions. Persons who had not worked the previous year exhibited more interest in a part-time schedule than those who transferred from other occupations.

Employment, 1980	83,000		
Projected employment, 1990	109,000	–	119,000
Percent change, 1980-90	31.3	–	42.8
Average annual openings, 1980-90	17,600	–	19,300
Growth	2,600	–	3,600
Replacement	15,000	–	15,700

Typists

Training. Employers generally hire high school graduates who can meet their requirements for typing speed. Some employers expect applicants to have word processing training or experience. Good spelling, punctuation, and grammar are important skills, and familiarity with standard office equipment and procedures is an asset.

Typing can be learned in different ways. Typing is taught in high schools, community colleges, business schools, and home study schools. Some individuals learn on their own, using self-teaching aids like books and records. More than 90,000 persons completed vocational education or business school programs in typing in 1979-80, but not all of them were planning to become typists. Some people learn to type for personal convenience, or because it is a useful skill for other jobs.

Employment patterns. Job prospects for typists are expected to be good throughout the 1980's due to the widespread availability of jobs and the relative ease of entry into the occupation. The expansion of employment resulting from increased business activity and the need to replace experienced workers who leave their jobs are projected to create between 300,000 and 315,000 job openings each year during the 1980's.

Replacement needs are expected to be the main source of jobs, accounting for 9 out of 10 openings during the decade. The proportion of typists who left the occupation in 1980—about one-fourth—was somewhat higher than the average for all occupations. Nearly half transferred to other kinds of work, about 40 percent left the labor force, and the remainder became unemployed. Typists who left the labor force did so chiefly because of household responsibilities or to attend school. The proportion of typists leaving the labor force for these reasons was significantly higher than the average for all occupations. Relatively few typists stopped working because of disability or retirement.

Many typing jobs are entry level and do not require office or business experience. The occupation accordingly attracts people outside the labor force, including many still in school. Of those who began working as typists in 1980, people who had not worked the previous year outnumbered those who had worked by 2 to 1. In 1980, about 97 percent of all typists were women, and the data indicate that movement from family responsibilities into the labor force and back to the home was typical. However, teenagers (16-19 years of age) filled 1 job opening in 4 in 1980; two-thirds of these jobs were part time. Teenagers and older workers (age 55 and above) were far more likely to take part-time typing jobs than workers between the ages of 20 and 54, most of whom worked full time.

Compared to the pattern for all occupations, the proportion of job openings for typists filled by workers who transfer from other occupations is lower than average. People who become typists tend to come from outside the labor force; many probably have never worked before. The proportion of all typists who transfer to other occupations is higher than average, suggesting that typing serves as a steppingstone to continued labor force activity. It is common for typists to transfer to another clerical job, such as secretary, statistical clerk, or stenographer.

Employment, 1980	1,067,000		
Projected employment, 1990	1,254,000	–	1,330,000
Percent change, 1980-90	17.5	–	24.6
Average annual openings, 1980-90	299,000	–	316,000
Growth	19,000	–	26,000
Replacement	280,000	–	290,000

Waiters and waitresses

Training. Most waiters and waitresses learn their skills on the job. Some gain experience by working as waiters' assistants, carhops, or food counter workers. Large res-

taurants and hotels generally prefer experienced workers and usually have higher educational standards than the 2 or 3 years of high school that smaller businesses generally accept. Some public and private vocational schools, restaurant associations, and large restaurant chains provide classroom training in a generalized food service curriculum. Other employers use self-instruction programs to train new employees. Knowledge of a foreign language may be helpful in restaurants specializing in foreign foods.

State laws often require waiters and waitresses to obtain health certificates showing that they are free of contagious diseases.

Employment patterns. Job openings for waiters and waitresses are expected to be plentiful through the 1980's due to very high turnover. On average, 790,000 to 825,000 jobs are projected to be available annually—more than for almost any other occupation. Beginners should find the best opportunities for employment in fast-food and other informal restaurants. Those who seek jobs in more expensive restaurants may experience keen competition. Employment of waiters and waitresses is projected to increase about as fast as the average for all occupations as the population grows and people dine out more. However, the need to replace experienced waiters and waitresses who transfer to other jobs or stop working is expected to account for 95 percent of all job openings—similar to the proportion for all occupations combined.

The separation rate for waiters and waitresses, like that for all food service occupations, is one of the highest among all workers. In 1980, 40 percent of all waiters and waitresses left their jobs—twice the rate for all workers. Nearly half transferred to other jobs, about 40 percent left the labor force, and the remainder became unemployed. Waiters and waitresses who stopped working did so chiefly to assume household responsibilities (38 percent) or to attend school (24 percent), higher proportions than for all occupations. Relatively few waiters and waitresses left the labor force because of retirement or disability.

Similar to all service workers, except private houshold workers, nearly one-third of those who entered the occupation during 1980 transferred from other jobs—compared to more than two-fifths for all occupations combined. More than two-thirds of those who took jobs as waiters and waitresses in 1980 had not worked the previous year, including many young students and older homemakers for whom the occupation serves as a source of income rather than a career. Of these waiters and waitresses, 34 percent had been in school (virtually all were under 25 years old) and 28 percent had household responsibilities (four-fifths were over 25 years old). Overall, nearly 70 percent of the persons who took jobs as waiters and waitresses in 1980 were 15-24 years old. In comparison, persons in this age group filled 60 percent of the openings in all service occupations, except private household, but only 47 percent of the job openings in all occupations combined.

Those with a high school education or less filled over three-fourths of the jobs for waiters and waitresses in 1980. Less than one-fifth of the entrants had some formal postsecondary education while only 5 percent were college graduates.

Seventy percent of the job openings for waiters and waitresses in 1980 were part-time positions, compared to 56 percent for all service workers, except private household, and only 34 percent for all occupations combined. Persons 15-24 years old filled three-fourths of these part-time jobs. The availability of part-time jobs that do not interfere with other responsibilities makes this occupation attractive to students and homemakers.

Employment, 1980	1,711,000		
Projected employment, 1990	2,072,000	–	2,188,000
Percent change, 1980-90	21.1	–	27.8
Average annual openings, 1980-90	788,000	–	823,000
Growth	36,000	–	48,000
Replacement	752,000	–	775,000

Welders and flamecutters

Training. Welding jobs differ in the degree of skill they require. Welding machine operators can learn the required procedures in several hours, while skilled manual welders need years of on-the-job training to master their craft. Most workers start as welders' helpers. Some participate in formal training programs to attain entry level skills. Programs are available in high schools, vocational-technical institutes, trade schools, and community colleges. The length of these programs varies; trade school programs generally take from 6 months to 1 year to complete. A few employers provide welding apprenticeships that generally last 3 to 4 years. Skilled manual welders who perform critical welding work such as that on oil pipelines or nuclear reactor components may be required to pass an examination of their welding skills and become "certified."

In 1979-80, approximately 37,000 persons completed public vocational education programs in welding. Another 12,000 individuals completed welding programs in private trade schools and nearly 2,000 youths completed Job Corps training. Not all of these took up welding; many entered occupations that require only the occasional application of welding skills, while others pursued careers unrelated to welding.

Employment patterns. Employment of welders and flamecutters is projected to grow at least as fast as the average for all occupations through the 1980's. The actual increase in the number of welders will be determined largely by the rate of expansion in the industries

producing heavy machinery, appliances, and the thousands of other products that welders help make. Through the 1980's, job openings due to employment growth and replacement needs are projected to average between 105,000 and 120,000 each year, which places welding among those occupations with the largest number of openings. Most openings are expected to arise because of replacement needs.

Welders and flamecutters are particularly vulnerable to periodic layoffs for factory retooling, and to economic downturns such as that in 1980. During that year, about half of all those who left the occupation became unemployed. Many of these workers are skilled and form a pool of potential reentrants who will resume working when jobs become available. Thus, although many openings for welders are expected during the 1980's, those seeking a first job may encounter considerable competition from experienced welders who are unemployed. Furthermore, employers tend to fill vacancies for machine welders from the ranks of company employees such as assemblers or helpers. Over half of those entering welding in 1980 transferred from another job. Those who have recently completed vocational training programs in welding will fill some openings, although graduates of these programs don't always become welders. Welding skills are applicable in many occupations.

Job opportunities in the 1980's are not expected to be equally favorable for all kinds of welders. The robot welding systems that are being introduced on manufacturing lines are eliminating the jobs of welding machine operators, although their full effect will depend on how rapidly and extensively the new technology is adopted. For many machine welding occupations, it is likely that automation will slow employment growth in the coming years. Highly skilled welders are not expected to be affected by automation for the foreseeable future, however, and could experience sharply increased demand if nuclear power regains favor or if synthetic fuels become economical. Job openings are expected to vary geographically, too; the best prospects will be in the Sunbelt and Western States.

Employment, 1980	573,000		
Projected employment, 1990	696,000	–	784,000
Percent change, 1980-90	21.6	–	36.9
Average annual openings, 1980-90	106,000	–	121,000
Growth	12,000	–	21,000
Replacement	94,000	–	100,000

Appendix A. Assumptions and Methods Used in Preparing Employment Projections

The Bureau's system for projecting economic and employment developments is comprised of a series of closely related projections encompassing the labor force, gross national product (GNP), industrial output and productivity, and employment in detailed industry groups and detailed occupations.

ASSUMPTIONS

The Bureau has prepared three different sets of assumptions, or scenarios, regarding economic growth through the 1980's. The assumptions concern fiscal policy, demographic trends, productivity, price levels, and similar factors through the decade. The low-trend scenario assumes continuing high inflation, low productivity growth, and moderate expansion in real production. The high-trend I version assumes marked improvement in both inflation and productivity, greater labor force growth, and higher real production. Finally, the high-trend II version assumes labor force growth consistent with the low trend, but greater productivity gains and less inflation than in the high-trend I version. Detailed information about these assumptions is presented in *Economic Projections to 1990*, BLS Bulletin 2121.

METHODS

Labor force, GNP, and industry output and employment

Beginning with population projections by age and sex developed by the Bureau of the Census, an estimate of the labor force is derived using projected labor force participation rates for each population group. In developing participation rates, the Bureau takes into account a variety of factors that affect decisions to enter the labor force, such as school attendance, retirement practices, and family responsibilities.

Real GNP then is calculated by subtracting assumed unemployment from the labor force projection and multiplying the result by a projection of output per worker. The estimates of future output per worker are based on an analysis of trends in productivity (output per workhour) and changes in average weekly hours of work.

Next, the projection of GNP is divided among its major components: Consumer expenditures, investment, government expenditures—Federal, State, and local—and net exports. These estimates of GNP by major component are derived using an economic model and by making assumptions about fiscal policy, taxes, and other major economic variables. Each of these major GNP components is in turn broken down by producing industry. Consumer expenditures, for example, are divided among industries producing goods and services such as housing, food, automobiles, medical care, and education.

Once estimates are developed for these products and services, they are translated into detailed projections of industry output, not only for the industries producing the final product—such as automobiles—but also for the industries that provide electric power, transportation, component parts, and other inputs required in the production process. Input-output tables developed by the Department of Commerce and modified by BLS are used to estimate output.

By using estimates of future output per workhour based on studies of productivity and technological trends for each industry, industry employment projections are derived from the output estimates. In addition, many detailed industries are studied using regression analysis. In these studies, equations are developed that relate employment by industry to combinations of economic variables, such as population and income, that are considered determinants of long-run changes in employment. The industry employment projections developed through these studies are evaluated with data generated by the basic model to develop the final industry employment projections. They also are used to develop projections for industries that are not included in the basic model.

Occupational employment

The method used to develop the 1990 occupational projections incorporated an industry-occupation matrix as the basic analytical tool. The general approach was to develop base-year (1980) estimates of occupational staffing patterns of industries, project these patterns to the target year of the projections (1990), and multiply the projected patterns by projected industry employment levels. The products—projected occupational employment by industry—were then summed across industries to derive an estimate of projected total employment by occupation.

This basic approach has been used by BLS to develop occupational projections since the mid-1960's. The step-by-step procedures used in developing the 1980-90 projections, however, were somewhat different from those used in previous years, in large part because the primary data base for occupational employment changed from the decennial census and the Current Population Survey (CPS) to the Occupational Employment Statistics (OES) surveys. One result of this change was an increase in the size of the matrix to 1,678 detailed occupations in 378 industries (primarily 3-digit SIC detail) from 377 occupations and 201 industries in the 1970-census-based matrix.

Base-year estimates

Separate estimates of 1980 employment were developed for wage and salary workers in OES survey industries, for wage and salary workers in agriculture and private households, and for self-employed and unpaid family workers. Data on wage and salary worker occupational employment were developed in an industry-occupation matrix format. Estimates of occupational employment of self-employed and unpaid family workers were developed at the total (all industry) level only. They were added to the total of wage and salary workers to derive estimates of employment by detailed occupation for the entire economy.

Wage and salary workers in OES survey industries. Base-year estimates were derived from the OES surveys for all industries except agriculture and private households, which are not included in the OES survey program. The OES surveys are conducted by mail from a sample of employers in each industry. They are conducted on a 3-year cycle—manufacturing industries the first year and nonmanufacturing industries divided in the other 2 years of the cycle. To develop occupational employment estimates for 1980, the occupational staffing patterns from the most recent OES survey for each industry were applied to 1980 estimates of total wage and salary employment in that industry. The staffing patterns for the 1980 matrix were developed from the OES surveys of manufacturing industries and Federal Government conducted in 1977, of several nonmanufacturing industries conducted in 1978, and of most of the balance of nonmanufacturing conducted in 1979. For hospitals and railroads, 1976 data were used since no later data were available. The Bureau's current employment statistics (CES) survey was the source of the 1980 annual average industry employment.

Wage and salary workers in agriculture and private households. Base-year estimates of wage and salary worker employment in agriculture and private households were developed from data in the 1980 Current Population Survey. The occupational distributions were based largely on the 1978 census-based matrix. Those estimates were based on 1970 census data modified by 1971-78 CPS trends in large occupations in these industries. Since the occupational configuration of the matrix was based on the OES survey classification scheme, the 1978 census matrix employment data for 377 detailed occupations were distributed into the 1,678 detailed occupations in the OES-based matrix. In this procedure, CPS data were generally used as control totals, which were distributed into appropriate detailed OES-matrix occupations. This distribution was based on established relationships between the census and OES occupational classifications. Many analytical judgments were necessary to establish relationships for many occupations because a perfect match between OES and CPS occupations was not always possible.

Self-employed and unpaid family workers. Base-year estimates of self-employed and unpaid family workers by occupation were based on 1980 CPS annual averages, as in previous census-based matrices, since no alternative data series exist. Similar to the procedure used for wage and salary workers in agriculture and private households, the employment data in the detailed census matrix occupations were distributed to the 1,678 occupations in the OES-survey-based matrix. In general, CPS data were used as control totals, and the distributions were based largely on the distribution of OES wage and salary employment unless other data were available or judgment derived from analyses indicated that this procedure would result in incorrect data. For example, certain jobs found only in government (such as health inspector) often fell into a broader CPS category (inspector) which contained self-employed and unpaid family workers. In such cases, the distribution was not based on the wage and salary worker distribution.

Data for self-employed and unpaid family workers were developed only at the all-industry level because of the unreliability of these data at the detailed industry level.

Projections

Wage and salary workers in OES survey industries. The basic procedure for projecting occupational employment was to develop data on past trends in the proportion of employment in each industry represented by each detailed occupation and to extrapolate this trend to the target year. These initial projections were then reviewed in detail for consistency with knowledge about technological change and other factors affecting the occupational composition of industries. Changes in the ratios developed through analytical judgments were placed in an updated matrix which was iterated to force it to add to 100 percent in each industry. The final step in the procedure was to apply the projected staffing pattern to projected industry employment totals. Total wage and salary employment in an occupation was obtained by summing across industries. Because of changes in the occupational content of the OES surveys from one year to the next, changes in the Standard Industrial Classification between the last two OES surveys for some industries, and other factors, technical problems were encountered in developing data on trends in staffing patterns for several industries. These problems are discussed in greater detail in *BLS Economic Growth Model System Used for Projections to 1990*, BLS Bulletin 2112.

Wage and salary workers in agriculture and private households. The initial projected 1990 staffing patterns, or ratios, for the agriculture and private household sectors were taken directly from the 1990 census-based matrix developed by the Bureau in 1978. These projected ratios were analyzed based on data that became available after the earlier matrix was developed, and a few ratios were adjusted. The census-based occupational distribution was converted to the OES survey distribution in a manner similar to the method used to develop the wage and salary worker base-year matrix described above.

The projected ratios were then applied to the 1990 industry employment projections. The resulting employment and ratios were reviewed in detail in the same manner as for wage and salary workers in OES survey industries. Changes in patterns that resulted from this review were incorporated into the final matrix.

Self-employed and unpaid family workers. To develop the projections, the percent distributions of self-employed and unpaid family workers by occupation from 1972-80 CPS data were extrapolated to 1990 and forced to add to 100 percent. A distribution of these proportions was made to OES survey occupations based on the distribution of 1980 data. These distributions were then reviewed and changes made where deemed appropriate. The resulting distribution was applied to projected totals for self-employed and unpaid family workers developed through the Bureau's economic model.

Total occupational employment. To develop total employment estimates by occupation, employment of wage and salary workers was added to totals of self-employed and unpaid family workers. With the exception of table C-1, projected employment data are presented in this bulletin for the low alternative and the higher of the two high alternatives. Unlike previous estimates of total national employment, the totals represent the number of jobs by occupation, not the number of persons employed by occupation. These totals are different because a person may have more than one job. The difference between the projected number of jobs and the projected number of persons employed in 1990 is roughly 7 percent.

Differences between the OES- and census-based matrices

There are significant differences between the national occupational employment data developed through the two matrices. The differences result largely from differences in the primary surveys that provide the data for each matrix—the decennial census and the Current Population Survey (CPS) for the census-based matrix and the OES surveys for the OES-based matrix. The important differences in the data are as follows:

1. In the census and the CPS, which are surveys of households, individuals with two or more jobs are counted only in their primary occupation. The OES surveys, which are surveys of employers, count jobs rather than individuals. Workers on the payrolls of two or more employers (establishments) are counted in the occupation held in each establishment. The distribution patterns differ between the two surveys because the occupational distribution of secondary jobs differs from that of primary jobs.
2. In the census and the CPS, persons on unpaid absences are counted as employed. In the OES surveys (as in the CES), these individuals are not included in the employment totals.
3. The reference date of the census is April 1. The CPS annual averages reflect monthly data collected in the week containing the 12th of the month. The OES surveys use the 12th of April, May, or June, depending upon which month shows the least year-to-year seasonal change for that industry.
4. The census and the CPS cover all classes of workers: private wage and salary workers (including agriculture and private household workers), government

workers, self-employed workers, and unpaid family workers. The OES surveys do not cover agricultural and and private household workers or self-employed and unpaid family workers.

5. The census and the CPS do not include workers under 16 years of age. In the OES surveys, those under 16 years of age are included if they are on the payrolls of establishments within the scope of the survey.
6. In the OES surveys, each occupation implies a specific skill level, as defined in each survey questionnaire. In the census and the CPS, job titles provided by respondents are grouped into categories which often include workers with greatly different skill levels.
7. In the OES surveys, respondents are instructed to report individuals who perform more than one job in the occupation of the job that requires the highest skill level. In responding to the census or the CPS, individuals report themselves in the occupation in which they work the most hours during the reference period.
8. The census and the CPS are generally completed by one individual who reports for all members of the household. Significant error can result from proxy respondents reporting occupations inaccurately. According to analyses, individuals in the census and CPS tend to upgrade their occupation. The OES surveys are completed by an official of the responding establishment, generally from personnel or payroll records.
9. In the census and the CPS, responses are coded into detailed occupational categories by coding clerks at the Bureau of the Census. There is little information on the survey form to use in coding occupations, usually only a job title and some description of major duties. As a result, there is the potential for significant coding error. A similar problem exists in coding industries. In contrast, in the OES surveys, employers code the occupations. The questionnaire has specific occupational definitions for respondents to classify their employees, regardless of job titles within the firm. The occupations are also industry specific; different industries receive different questionnaires. It is believed that the magnitude of the coding error is smaller in the OES surveys for these reasons.
10. The 1970 census distributed occupational employment into 201 industries, generally combinations of 2-, 3-, or 4-digit industries based on the 1967 Standard Industrial Classification (SIC). The OES surveys collect data for 378 industries by 3-digit SIC. Since 1976, the surveys have been based on the 1972 SIC (as revised in 1977) and match the industry classification in other BLS surveys.

A comparison was made of the wage and salary employment levels for 105 detailed occupations that were definitionally comparable between the 1978 census-based matrix (the last national census matrix produced) and the 1978 OES-based matrix (the first OES matrix produced). OES-based matrix employment was higher than census-based matrix employment in 52 of the comparable occupations, and lower in the remaining 53. The range was from 229 percent higher than census-based employment to 49 percent lower. The average of the difference for all 105 comparable occupations was 31 percent. In numbers, the range was from about 327,000 more stock clerks in the OES matrix to almost 1.3 million fewer secretaries.

The distribution of employment differences was highly skewed, reflecting several occupations where OES-based employment was much higher than census-based employment. Differences for most occupations, however, were much smaller than these extremes. As the following tabulation shows, 7 out of 10 occupations had differences lower than 30 percent, and more than one-half had differences under 20 percent.

Differences between census-based and OES survey-based wage and salary employment, 1978	*Percent of occupations*	*Cumulative percent*
Less than 10 percent	30	30
10 to 19 percent	24	54
20 to 29 percent	17	71
30 to 39 percent	10	81
40 to 50 percent	8	89
50 or more percent	11	100

Appendix B. Estimating Replacement Needs

Information on replacement needs previously published by the Bureau of Labor Statistics was confined primarily to estimates of the need to replace individuals who permenantly left the labor force due to death or retirement.[1] Although the Bureau was aware that a significant shortcoming of these replacement estimates was the failure to account for workers who left the labor force temporarily or transferred to another occupation, sufficient data were not available to develop estimates of such replacement needs. Using Current Population Survey (CPS) data, however, procedures for calculating replacement needs have been revised so that the data now include occupational transfers and all labor force separations except deaths.

Sources of data

Because of its design, the CPS permits data to be obtained 1 year later for 50 percent of the households in each monthly survey.[2] Each monthly CPS sample consists of eight subsamples of households termed rotation groups. One new rotation group is introduced into the sample each month. Each new group is surveyed for 4 consecutive months, excluded from the sample for the next 8 months, then surveyed again for the next 4 consecutive months. After being interviewed eight times, members of each group are dropped from the survey. Individuals in households in four of the rotation groups can be identified in surveys taken 1 year apart by matching household, age, race, and sex information from micro data computer files. For matched individuals, data about changes in their labor force status and occupation can be tabulated for both periods. However, primarily because those who move to another household during the year are not included in the survey a year later, data can only be produced for about 35 percent—rather than about 50 percent—of the persons in the entire CPS sample. Longitudinal data computed from this matching process are the framework for the revised estimates of replacement needs. They have been termed "matched data" in the discussion which follows.

In developing information about changes in labor force status and occupation for 1980-81, several factors were considered which affected the selection of the specific monthly data to be included in the matched sample. One consideration was the availability of additional information from questions about occupational mobility added to the January 1981 CPS questionnaire. As discussed below, occupational mobility data from the January 1981 CPS were used in conjunction with matched data to estimate replacement needs. Because occupational mobility data were available only for January 1980-81, matched data with that period as the midpoint were sought to reduce the impact of varying economic conditions. Other considerations were the advantages of increasing the sample size so that more detailed occupations could be examined, and reducing the impact of seasonal factors. As a result of these considerations, matched data describing movements over a 1-year period were prepared for each of 18 months beginning with January 1979 to January 1980 data and ending with June 1980 to June 1981 data.

Data in each monthly matched CPS sample were used to tabulate changes in the labor force status of workers 1 year later by occupation. Although economic conditions and unemployment rates varied, the proportion of persons remaining employed from 1 year to the next was relatively stable from month to month, varying from a low of 86.7 percent to a high of 88.2 percent. Variations in the data about persons becoming employed who previously were unemployed or out of the labor force also were of about the same magnitude in each monthly sample. Since the rates of movement were similar for all periods and a larger sample was desired to improve the relability of data for small occupations, the samples were combined to create a matched sample of 665,502 persons age 15 and older in the initial year of the matched data. Data about the same individual but for different months appear in the combined sample. Although the CPS monthly data come from 1979, 1980, and 1981, the combined sample is identified as "matched data".

To produce weighted data, CPS weights from the full sample for each month were applied to each person and divided by the number of months for which matched data were prepared. The weighted numbers approximate 35 percent of those that would result if it

[1] *Tomorrow's Manpower Needs*, Volume I, Bulletin 1606 (Bureau of Labor Statistics, 1969), p. 47.

[2] For additional information about the survey, see *The Current Populaton Survey: Design and Methodology*, Technical Paper 40 (Bureau of the Census, 1978).

were possible to match a complete monthly sample from year to year.

Besides changes in an individual's labor force status, the matched CPS data identify workers who change their occupation.[3] However, matched data on occupational mobility significantly overstate actual movements because individuals may respond differently to the same CPS question about their occupation, responses may be recorded differently by interviewers, or recorded information may be coded differently by clerks.[4]

To surmount the overstatement of occupational change in the matched data, results of a CPS study of occupational mobility conducted during January 1981 that provided reliable data were merged with the matched sample. In the January 1981 CPS questionnaire, persons employed in Jaunary 1981 were asked to report their labor force status in January 1980 and, if employed, their occupation. Since only employed persons were asked to respond to the supplemental questions, it was not possible to assess separations from the work force from these data: Individuals employed in January 1980 but not working in January 1981 could not be identified. The longitudinal data on occupational mobility from the January 1981 CPS are termed "retrospective data" in the discussion that follows.

The following example illustrates how matched data about changes in labor force status were merged with retrospective data about occupational mobility to produce data on labor force and occupational changes for secretaries. Those data have been termed "merged data." The result is a composite description of movements into, out of, and between occupations over a 1-year period.

In developing the merged data, it was first necessary to develop separate tabulations of matched data and retrospective data. Table B-1—which presents matched data—indicates that 89.2 percent of secretaries in 1981 were employed the previous year, 2.4 percent were unemployed, and 8.4 percent were out of the labor force. Of those employed in 1981, 60.9 percent were employed in the same occupation in 1980 and 28.3 percent transferred from another occupation in 1980. Because these date overstate transfers for reasons stated above, the matched data about persons employed in the same occupation and those transferring in were adjusted using retrospective data.

Table B-2 illustrates the occupational mobility data derived from the January 1981 CPS. It identifies the number of secretaries in January 1981 who were also employed in January 1980 (3,366,782) and the proportion of that number (92.4 percent) who were employed as secretaries. This is significantly higher than the 60.9 percent shown in the matched data. For clarity, this proportion can be expressed as:

$$\frac{\text{Number of secretaries in January 1981 who also were secretaries in January 1980}}{\text{Number of secretaries in January 1981 who were employed in any occupation in January 1980}} = \frac{3,109,077}{3,366,782} = .924$$

The matched data in table B-1 indicate that 1,189,596 individuals currently employed as secretaries had been employed in some occupation a year earlier. To estimate the number who had been employed in the same occupation, but based on the January CPS data rather than the restrospective data, the following calculation was made:

Matched data		*Retrospective data*		*Merged data*
Number of secretaries in 1981 who had been employed in any occupation a year earlier	×	Number of secretaries in January 1981 who were secretaries in January 1980 / Number of secretaries in January 1981 who were employed in any occupation in January 1980	=	Estimated number of secretaries in 1981 who were secretaries in 1980
1,189,596	×	.924	=	1,098,592

[3] Movement between any of the detailed, 3-digit occupations from the *1970 Census of Population Classified Index of Industries and Occupations* (Bureau of the Census, 1971).

[4] Cande L. Collins, "Comparison of Month-to-Month Changes in Industry and Occupation Codes with Respondents Report of Change: CPS Jobs Mobility Study," Response Research Staff Report No. 75-5 (unpublished, Bureau of the Census, May 15, 1975), table C, p. 7.

Table B-1. 1980 labor force status of secretaries employed in 1981

Source of data	Total employed, 1981	1980 labor force status				
		Employed			Unemployed	Not in labor force
		Total	Same occupation	Different occupation		
Matched data:						
Number	1,333,807	1,189,596	811,747	377,849	31,963	112,249
Percent	100.0	89.2	60.9	28.3	2.4	8.4
Merged data:						
Number	1,333,807	1,189,596	1,098,592	91,004	31,963	112,249
Percent	100.0	89.2	82.4	6.8	2.4	8.4

Table B-2. Secretaries in January 1981 who were employed in January 1980

Source of data	Employed, January 1980		
	Total employed, January 1981	Same occupation	Different occupation
Retrospective data:			
Number	3,366,782	3,109,077	257,705
Percent	100.0	92.4	7.7

This calculation resulted in an estimate of 1,098,592 persons in the matched sample who worked as secretaries in 1981 and 1980. The difference between that number and the number of secretaries in 1981 who had been employed in any occupation a year earlier (1,189,596 - 1,098,592 = 91,004) identified the number of persons who transferred into secretarial positions. The merged data about movements into occupations are presented in table B-1.

Preparing information about movements out of occupations also entails merging CPS data. Table B-3 presents 1981 information about individuals employed as secretaries in 1980. It indicates that 811,747 secretaries in 1980 continued to be secretaries in 1981. Note that the matched data in table B-1 identified that same number of secretaries in 1981 as having been secretaries in 1980. (The proportion remaining in the same occupation, however, viewed from the previous or the current year, will be different because the base employment will differ from year to year.) The first step in adjusting the matched data about movements out of an occupation is to substitute the merged data estimate of the absolute number of persons remaining in the same occupation from table B-1 (1,098,592) for that in table B-3. Once the number of secretaries employed in 1980 who continued working as secretaries has been identified, January 1981 retrospective data can be used to estimate occupational transfers.

Table B-4 presents information about secretaries employed in January 1980 who remained employed in any occupation in January 1981 and about those who continued to work as secretaries. It indicates that 91.0 percent of all secretaries in January 1980 who continued working in January 1981 were secretaries. This proportion can be expressed as:

$$\frac{\text{Number of secretaries in January 1980 who also were secretaries in January 1981}}{\text{Number of secretaries in January 1980 who were employed in any occupation in January 1981}} = \frac{3,109,077}{3,415,395} = .910$$

This proportion from the January 1981 CPS was combined with matched data to produce merged data. The merged data in table B-3 indicate that 1,098,592 secretaries employed in 1980 were secretaries in 1981.

The number employed in any occupation in 1981 was calculated as follows:

Matched data		*Retrospective data*		*Merged data*
Secretaries in 1980 who were secretaries in 1981	÷	Number of secretaries in January 1980 who were secretaries in January 1981 / Number of secretaries in January 1980 who were employed in any occupation in January 1981	=	Estimated number of secretaries in 1980 who were secretaries in 1981
1,098,592	÷	.910	=	1,206,978

The difference between the number of secretaries in 1980 who remained employed in any occupation in 1981 and those who continued working as secretaries (1,206,978 - 1,098,592 = 108,386) is the estimated number of secretaries transferring out of the occuption. Unlike the matched data about movements into occupations, total employment of secretaries in 1980 must be calculated by summing the data about their 1981 activities before proportions for each are calculated. The resultant merged data provide a composite description of labor market activities of secretaries and are presented in table B-3.

Table B-3. 1981 labor force status of secretaries employed in 1980

Source of data	Total employed, 1980	1981 labor force status				
		Employed			Unemployed	Not in labor force
		Total	Same occupation	Different occupation		
Matched data:						
Number	1,323,086	1,189,428	811,747	377,681	27,264	106,395
Percent	100.0	89.9	61.4	28.6	2.1	8.1
Merged data:						
Number	1,340,637	1,206,978	1,098,592	108,386	27,264	106,395
Percent	100.0	90.0	82.0	8.1	2.0	7.9

Table B-4. Secretaries in January 1980 who were employed in January 1981

Source of data	Employed, January 1981		
	Total employed, January 1980	Same occupation	Different occupation
Retrospective data:			
Number	3,415,395	3,109,077	306,858
Percent	100.0	91.0	9.0

Developing replacement needs

Once data about movements into, out of, and between occupations have been developed, they can be used to produce informaton about replacement needs. When employment in an occupation increases from 1 year to the next, replacement needs equal the number of persons who leave the occupation for any reason—transfers, labor force separations, and those who become unemployed.[5] When employment declines, replacement needs equal the number who leave minus the decline in employment.

It may not seem appropriate to include movements into unemployment in estimates of replacement needs since individuals who become unemployed are not replaced. However, even though a job is not created when a person becomes unemployed, openings due to movement into unemployment are not captured in growth estimates by changes in employment levels, as the following example illustrates.

Assume in any given time period that 500 employees in a specific occupation in one firm are laid off permanently and become unemployed. If employment in that same occupation increases in other firms during the same period by 500 workers, the decline in employment caused by the 500 who became unemployed will be offset, and the change in employment will be measured as zero. Without counting workers who become unemployed in replacement needs, the 500 openings will not be accounted for in the openings estimates. Therefore, because job openings due to growth are understated by the way change in employment is measured, it is appropriate to include movement from employment to unemployment in estimating job openings due to replacement needs.

The methodology for estimating replacement needs for specific occupations varied depending on whether employment increased or decreased from 1 year to the next in the matched data. For those occupations in which employment increased, the proportion of employees who had to be replaced was equated to the proportion of 1980 employees identified in the merged data as not being in the same occupation in 1981. For example, employment of engineers increased from 1980 to 1981 and 93.8 percent remained in the same occupation. Thus the replacement rate—those not in the same occupation—was 6.2 percent (100.0 - 93.8 = 6.2 percent). In the case of secretaries and some other occupations, employment declined and active replacement needs were not equal to the proportion of persons leaving the occuption during 1980-81. As shown in tables B-1 and B-3, secretarial employment declined from 1,340,637 in 1980 to 1,333,807 in 1981 a decline of 0.5 percent. Table B-3 indicates that 18.0 percent (100.0 - 82.0 = 18.0 percent) left the occupation from 1980 to 1981. Because employment declined, however, not all those leaving secretarial jobs were replaced during 1980-81. Thus, the proportion leaving the occupation was reduced by the decline in employment to determine the proportion who were replaced. For secretaries, replacement needs were calculated as 17.5 percent (18.0 - 0.5 = 17.5 percent).

Replacement rates for 1980-81 provide valuable insights into the major source of employment opportunities. However, 1980-81 was atypical in that employment grew slowly and unemployment was increasing, characteristics that are inconsistent with assumptions for the projected period. As a result, 1980-81 replacement rates might be affected by economic conditions and be inappropriate for use in another time period.

In order to assess the impact of reduced economic activity on the 1980-81 replacement rates, occupational employment change and separation data were compared with those for 1977-78. Merged data prepared from matched data for 1977-78 and January 1978 retrospective data about transfer were available and permitted consistent comparisons of the 1980-81 data with those from a period of rapid employment growth and declining unemployment. Because economic conditions differed significantly between 1977-78 and 1980-81, differences in the data for movements reflect the impact of reduced economic activity and permit adjustments to the projected replacement rates. Data for the major occupational groups illustrate the process used to project replacement rates for each occupation.

Table B-5 contains information about occupational separations for 1977-78 and 1980-81. The expectation that movement into unemployment would increase during periods of economic decline was confirmed by the data for craft workers; operatives, except transport; transport operatives; nonfarm laborers; and farm laborers. Except for nonfarm and farm laborers, the increased movement into unemployment was accompanied by employment declines, which provided another indication that the occupation is affected by economic conditions. Data for the other groups showed lesser changes in the proportion of persons becoming unemployed, indicating that economic activity has little effect on separations.

[5] Merged data do not include those who leave the labor force because of death because records are based on data for two points in time for the same individual. See "Data limitations" section for additional information.

Table B-5. Comparison of occupational separation rates, 1977-78 and 1980-81

(Percent)

Occupational group	Employed, base year	Occupational separations				
		Total	Occupational transfers	Not working		
				Total	Unemployed	Not in the labor force
Professional and technical workers:						
1977-78	100.0	12.3	5.8	6.5	1.2	5.3
1980-81	100.0	11.2	5.2	6.0	1.2	4.8
Managers and administrators, except farm:						
1977-78	100.0	12.1	6.3	5.8	1.2	4.6
1980-81	100.0	11.6	5.9	5.7	1.5	4.1
Sales workers:						
1977-78	100.0	23.4	11.6	11.8	2.4	9.4
1980-81	100.0	23.4	11.0	12.4	2.6	9.8
Clerical workers:						
1977-78	100.0	21.4	10.6	10.8	2.3	8.5
1980-81	100.0	21.6	10.5	11.1	2.4	8.7
Craft and kindred workers:						
1977-78	100.0	13.9	7.0	6.9	2.5	4.4
1980-81	100.0	16.0	7.2	8.9	4.3	4.5
Operatives, except transport:						
1977-78	100.0	22.7	11.8	10.9	3.9	7.0
1980-81	100.0	24.0	9.7	14.4	7.1	7.3
Transport equipment operatives:						
1977-78	100.0	18.9	11.2	7.7	2.8	5.0
1980-81	100.0	19.4	9.2	10.3	5.2	5.1
Nonfarm laborers:						
1977-78	100.0	31.8	16.4	15.4	5.5	9.9
1980-81	100.0	33.1	13.8	19.3	8.2	11.1
Farmers and farm managers:						
1977-78	100.0	13.1	3.0	10.1	.2	9.9
1980-81	100.0	12.4	2.1	10.2	.4	9.9
Farm laborers and supervisors:						
1977-78	100.0	32.9	11.4	21.5	2.8	18.7
1980-81	100.0	28.4	7.5	20.9	3.5	17.4
Service workers, except private household:						
1977-78	100.0	28.0	11.7	16.3	3.6	12.7
1980-81	100.0	27.5	10.7	16.8	3.9	12.8
Private household workers:						
1977-78	100.0	40.1	4.5	35.6	4.7	30.9
1980-81	100.0	39.6	3.0	36.7	4.1	32.6

SOURCE: Merged data.

Reduced economic activity also seemed to be reflected in reduced transfers among operatives, laborers, and private household workers. This may reflect a reluctance to change jobs, or a lack of opportunity to transfer to other jobs, or both. Because the relationship between occupational transfers and economic activity is complex, the 1980-81 transfer data will be used without adjustment for the projected period. This could result in replacement needs being understated for some occupations.

The data about separations in table B-5 are virtually the same for professional and technical workers; managers and administrators; sales workers; clerical workers; farmers; and service workers for both 1977-78 and 1980-81, indicating that these occupations are not significantly affected by different economic conditions. In the case of private household workers, a decline in transfers and movement into unemployment was offset by increased labor force separations, leaving the overall separation rate at about the same level. Because replacement rates for these occupational groups were stable, they have been used as the projected rates.

In contrast, employment of craft workers; operatives, except transport; and transport operatives declined in 1980-81 compared with 1977-78, indicating sensitivity to reduced activity in the construction and manufacturing industries. In these cases, the 1980-81 replacement rate was adjusted by reducing the separation rate by the percentage decline in employment since not all workers leaving the occupation were replaced. For the projected period, employment in each of these occupations is expected to increase, and no reduction in separations is appropriate. However, the 1980-81 separation rate for each of these occupations—as well as that for nonfarm and farm laborers—is inflated by increased movements into unemployment. To produce projected replacement rates for these groups, 1977-78 data about movements into unemployment are substituted for 1980-81 data. The occupational separation rate that results from combining 1977-78 data about movement into unemployment with 1980-81 data about other separations is the projected replacement rate. Because the impact of occupational transfers has not been taken into account, these rates may understate replacement needs. As a larger data base of matched and retrospective data is built up over the years, research will be conducted

to see if the transfer rates can be adjusted for changes in economic conditions.

Projected annual replacement needs for 1980-90 were calculated by applying the replacement rate developed from the merged data to employment for the mid-point of the projected period. Because OES or other data are used to determine current and projected employment, each occupation has been scrutinized and replacement needs data developed only when the CPS and the OES or other data source are judged to be definitionally consistent.

Comparison with previous data

Table B-6 presents a comparison of replacement rates based on the projected merged CPS data with rates based on the working life table, used in the 1980 edition of this publication. The CPS data generally yield rates 3-5 times those based on the working life table even though the CPS rates exclude data about deaths. The differences between the rates are attributable to differences in the concept of replacement needs.

In previous studies, BLS used the working life table to estimate job openings resulting from deaths and retirements. [6] In order to obtain a death and retirement rate for an occupation, the combined death and retirement rate for a specific age-sex group in the table was applied to occupational employment in that age-sex group; the weighted average of all age-sex groups was then used as the separation rate for the occupation.

Working life tables are constructed from differences in labor force participation rates for persons of different ages. Because a labor force participation rate measures the proportion of any age group which is in the labor force, differences in rates measure the net of separations from and accessions to the labor force. In the working life table, a positive difference in rates—the result of an increasing labor force participation rate—is considered as an accession. A negative difference in the rates—the result of a declining labor force participation rate—is considered as a separation due to retirement.

Table B-7 presents part of the 1970 table of working life for males. Death is responsible for all separations through 30 years of age; there are no separations because of retirement below age 30. However, there are accessions to the labor force, which reflect an increasing labor force participation rate. For men age 30 and over, the table shows no accessions but does show separations because of retirement as the labor force participation rate declines. Like accesssions, separations because of retirement are a net measure—the difference between persons entering or reentering and those leaving the labor force. Consequently, using retirement rates from working life tables to compute the absolute number of job openings from replacement needs understates the actual by the number of persons entering or reentering the labor force. For example, assume one 40-year-old man is employed while a second man, also age 40, is outside the labor force. If, after a year, the first man has left the labor force, perhaps because of a permanent injury, a labor force separation and a job opening will have occurred. If the second man fills the job opening created by the first, a labor force accession occurs. However, if there were no other changes, there would be no change in the labor force participation rate of 40- and 41-year-old males. As a result, an estimate of job openings based on change in labor force partici-

[6] *Tomorrow's Manpower Needs*, pp. 47-55.

Table B-6. Comparison of occupational replacement rates based on working life table and rates based on merged CPS data[1]

(Percent)

Occupational group	Working life table [2]	Merged CPS data [3]
Total	3.8	19.4
Professional and technical workers	3.0	11.2
Managers and administrators, except farm	3.8	11.6
Sales workers	3.8	23.3
Clerical workers	5.1	21.6
Craft and kindred workers	2.8	14.1
Operatives, except transport	2.8	20.9
Transport equipment operatives	2.3	17.0
Nonfarm laborers	2.6	30.4
Farmers and farm managers	7.2	9.1
Farm laborers and supervisors	4.1	27.7
Service workers, except private household	4.6	27.5
Private household workers	6.6	39.6

[1] Working life table data include deaths; merged CPS data do not.
[2] Annual rates for both sexes used in *Occupational Projections and Training Data, 1980 Edition.*
[3] Annual rates for both sexes used in *Occupational Projections and Training Data, 1982 Edition.*

Table B-7. Estimated rates of entering and leaving the labor force for men in 1970 by age

(Entries per 1,000 persons in the stationary population; separations per 1,000 persons in the stationary labor force)

Age	1970			
	Entry rate	Separation rate		
		Total	Due to death	Due to withdrawal
16-19	476.0	1.7	1.7	-
20-24	84.2	2.3	2.3	-
25-29	12.1	2.0	2.0	-
30-34	-	2.5	2.3	0.2
35-39	-	4.4	3.1	1.3
40-44	-	6.7	4.9	1.8
45-49	-	11.0	7.6	3.4
50-54	-	17.2	11.8	5.4
55-59	-	32.9	18.6	14.3
60-64	-	103.3	28.4	74.9
65-69	-	107.7	43.6	127.1
70-74	-	166.4	61.8	104.6
75-79	-	169.3	89.6	79.7
80-84	-	284.6	130.6	154.0
85+	-	-	-	-

SOURCE: *Length of Working Life for Men and Women, 1970*, Special Labor Force Report 187 (Bureau of Labor Statistics, 1979), table 3

pation rates would be zero. Yet, an actual separation and a job opening did occur.

Working life tables used by BLS in the past assumed that males, once in the labor force, remained until retirement or death. The tables for women, however, included temporary labor force separations because of marriage, or the presence of young children. These temporary separations also were calculated using data about changes in the labor force participation rates for specific groups of females and, as a result, measure net rather than gross separations.

Earlier this year the Bureau revised the methodology used in preparing working life tables.[7] Matched CPS data about annual movements of individuals into and out of the labor force have replaced net separations based on changes in labor force participation rates. Because the new working life tables do not estimate total separations from an occupation, they have not been used to estimate replacement needs.

Replacement rates based on CPS merged data differ conceptually from those computed from working life tables in that they measure total separations from the occupation. Total separations include occupational transfers—which account for about half of the total–and all labor force separations except deaths. Individuals who die while employed are not included in the total because the data are not available. This limitation to the data is discussed in the next section.

Data limitations

In evaluating the data, several limitations were identified. The most significant were biases in the matched data from response and coding errors, and the exclusion of persons who died or who moved in the year between surveys. The first tends to overstate occupational separations while the others understate them. Each limitation is discussed below and, where possible, its impact on movements quantified.

Response and coding errors. The labor force status or occupation of some individuals in the CPS is reported incorrectly by respondents, or is misclassified or miscoded by interviewers or clerks. Such errors do not significantly affect cross-sectional data from the survey because the net error is small. For example, the monthly estimates include as employed some persons who should be classified as unemployed or not in the labor force and also include approximately the same number of persons as unemployed or not in the labor force who should be classified as employed.[8] As a result, the absolute number of employed persons in any month has little error. However, when CPS data are used to develop longitudinal data, response and coding errors create false measures of movement. If employed persons classified as not in the labor force during the first survey are classified as employed during the second, the matched data will indicate movement where none occurred.

While response errors in the CPS are known to exist and have been examined, their impact on the accuracy of CPS matched longitudinal data has not been conclusively determined. A recent study determined that response errors in the CPS matched longitudinal data offset each other in much the same manner as in cross-sectional data.[9] Table B-8 presents matched and retrospective longitudinal information about the same persons from January 1977 to January 1978. As expected, the matched data show more mobility than the retrospective, but the differences are small. There is no significant difference in the ratio of movement from unemployment while the rates of movement from out of the labor force differed by 15 percent. Because the retrospective data in table B-8 exclude information about persons who change residence and are not subject to the same response and coding errors as the matched data, the proportion of persons employed in both years is higher than that derived from the matched data. As shown in the last section, if data on persons who changed residence were included the proportion would be less.

Errors in occupational classification also have been examined by the Census Bureau. A study comparing estimates of occupational mobility derived from matched January 1972-73 data and the January 1973 retrospective data reported "...the level of occupational mobility (between major occupational groups) derived from the retrospective data is only about one-fifth that based on the matched comparison (4.2 percent vs. 22.8 percent."[10]

[7] Shirley J. Smith, "New Worklife Estimates Reflect Changing Profile of Labor Force," *Monthly Labor Review*, March 1982, pp.15-20.

[8] *The Current Population Survey Reinterview Program January 1961 Through December 1966*, Technical Paper 19 (Bureau of the Census, 1968).

[9] Van Anthony, "Potential Effect of Response Errors in the CPS on Measurements of Labor Force Movements" (unpublished memorandum, Bureau of Labor Statistics, February 26, 1980), p. 8.

[10] Paula J. Schneider, "Evaluation of the Occupation One-Year Ago Item in the January 1973 CPS" (unpublished, Bureau of the Census, 1976), p. 3.

Table B-8. Comparison of January 1977-78 CPS matched data and January 1977-78 CPS retrospective data on labor force changes for persons remaining at the same residence

Labor force status	Matched data	Retrospective data	Ratio, matched to retrospective data
Total employed, 1978:			
Number	31,070,978	31,070,978	1.0
Percent	100.0	100.0	1.0
Employed, 1977	86.9	87.9	1.0
Unemployed, 1977	4.0	4.0	1.0
Not in labor force, 1977	7.8	6.8	1.2
Age 15, 1977	1.3	1.3	1.0

This and other studies of matched and retrospective data conclude that retrospective data consistently underestimate, and matched data overestimate, occupational mobility.

The Census Bureau studies convincingly established that the matched CPS data significantly overstated occupational transfers but were less convincing in establishing that the retrospective data significantly understate these movements; data from a study by the Office of Education showed approximately the same rate of separations among teachers as the retrospective data.[11] In the absence of an alternative, therefore, the restropective data were selected as the more reliable and the lower limit for estimates of occupational transfers.

Exclusion of persons who die. Individuals who die between surveys do not appear in both surveys and cannot be part of the CPS matched data file. Thus the CPS matched data exclude occupational separations due to deaths. Since some employed individuals die and must be replaced, however, the replacement needs data are biased downwards to the extent that they exclude deaths.

One measure of the bias that exclusion of deaths has on replacement needs is the mortality rate for employed persons estimated by using mortality data for the population and census-based age and sex employment data. For all employed persons in 1980, this mortality rate was 0.6 percent and varied between occupations with differences in the age and sex distribution of employees. However, available data indicate that applying mortality data for the population to occupational employment data overstates estimates of replacement needs because (1) mortality among employed persons is less than that of the population as a whole and (2) mortality varies by occupation. Comparisons of Social Security mortality data for employed persons and mortality data for the general population show that the mortality rate for employed perios is about 80 percent that of the population.[12] The difference reflects the fact that employed persons are healthier: They are less likely to be disabled or suffer from chronic diseases. Another study using data from a large company has identified variations in mortality rates by occupation.[13] Professional and supervisory occupations—occupations in the highest social-economic level—had mortality rates approximately 60 percent those for the population.

Depending on the occupation, excluding deaths probably understates replacement needs by .4 - .7 percent. The lower figure is probably associated with occupations having the lowest occupational separation rates—those with the highest socioeconomic levels. Of course, the relative error of excluding deaths in the replacement rate depends on the occupational replacement rate. For the 44 CPS occupations with rates less than 5 percent—the decile with the lowest separation rates—the error may be greater than 10 percent. However, for the 44 with separation rates exceeding 35 percent—the decile with the highest separation rates—the error is less than 1.5 percent. Overall, 80 percent of the CPS occupations probably have a relative error in the replacement rate of 1.5 to 10 percent due to the exclusion of deaths.

Exclusion of persons who change residence. The matched sample was created by identifying persons who appeared in the monthly CPS sample in two consecutive years. Unfortunately, some individuals who were in the first sample and should have been in the sample a year later could not be identified. Some of these were persons who died. Others probably were missed because of coding errors or other data processing problems. However, individuals who changed their residence were a more significant problem.[14] For any rotation group in the sample, CPS interviewers obtain information about individuals at a specific address. Thus, individuals who move are not included in the sample a year later.

A comparison of labor force and occupation status for persons who did and did not change residence is presented in table B-9 based on the retrospective data. Those persons employed in January 1981 who did not change residence also were less likely to have changed occupation or labor force status. B-9 also presents merged data. Although merged data exclude persons who move, the merged data on changes in occupation and labor force status are quite close to the information for all persons combined. Apparently the overstatement in movements resulting from response error is compensated for by the exclusion of persons who moved.

[11] A. Stafford Metz and Howard L.Fleischman, *Teacher Turnover in Public Schools Fall 1968 to Fall 1969*, DHEW Publication No. (OE) 74-11115 (Department of Health, Education, and Welfare, Office of Education, 1974), p.3.

[12] Pierre Decoufle, "Letters to the Editor," *Journal of Occupational Medicine*, September 1977, tables 1 and 2, pp. 582-84; and A.J. McMichael, "Standardized Mortality Ratios and the 'Healthy Worker Effect': Scratching Beneath the Surface," *Journal of Occupational Medicine*, March 1976, pp. 165-68.

[13] M. Gerald Ott, Benjamin B. Holder, and Ralph R. Langner, "Determinants of Mortality in our Industrial Population", *Journal of Occupational Medicine*, March 1976, table 7, p. 175.

[14] For additional information about reasons for nonmatches see *Consistency of Reporting of Ethnic Origin in the Current Population Survey*, Technical Paper 31 (Bureau of the Census, 1974), appendix C.

Table B-9. Changes in labor force status and occupation by residence status

Labor force status	1980-81 merged data	January 1980-81 residence status[1]					
		Total	Same residence	Different residence			
				Same State		Different State	Different country
				Same county	Different county		
Total employed, 1981	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Employed, 1980	89.0	88.5	90.1	85.7	78.8	67.8	39.9
Same occupation	80.1	79.7	83.1	70.9	58.8	40.4	20.1
Different occupation	8.9	8.9	7.0	14.8	20.1	27.5	19.8
Not working, 1980	9.6	10.5	8.8	13.8	20.5	31.6	60.1
Age 15, 1980	1.4	1.1	1.1	.6	.7	.5	.1

[1] January 1981 CPS.

Appendix C. Detailed Occupational Projections

This appendix presents estimates of 1980 employment and projections of 1990 employment by detailed occupation. Table C-1 provides 1980 estimates of employment, three alternative 1990 projections (see discussion of projections in appendix A), and the 1980-90 percent change for 670 detailed occupations. This table includes only occupations with 1980 employment of 5,000 or higher. Tables C-2 through C-6 list 893 occupations having fewer than 5,000 workers in 1980. These occupations are listed alphabetically in five employment size groups: 4,000-4,999; 3,000-3,999; 2,000-2,999; 1,000-1,999; and under 1,000. Because of the small size of the occupations, the employment estimates are unreliable. These lists are presented to give the reader some idea of the variety of occupations for which data are being collected through the Occupational Employment Statistics surveys. Definitions used to collect data on employment in these occupations appear in the *OES Dictionary of Occupations*.

Table C-1. Employment, 1980 and projected 1990 (three alternatives), and percent change, 1980-90 in occupations with 1980 employment of 5,000 or higher

(Thousands)

Occupation	Employment, all industries				Percent change		
	1980	1990 (Low)	1990 (High I)	1990 (High II)	1980-90 (Low)	1980-90 (High I)	1980-90 (High II)
Total, all occupations	102,107.3	119,591.1	127,908.4	121,448.5	17.1	25.3	18.9
Professional, technical, and related workers	16,395.2	19,662.3	20,727.6	19,917.4	19.9	26.4	21.5
Engineers [1]	1,177.8	1,504.3	1,624.3	1,531.2	27.7	37.9	30.0
Aeronautical and astronautical engineers	68.0	97.6	103.6	100.1	43.4	52.3	47.2
Chemical engineers	55.5	68.4	73.1	70.0	23.2	31.6	26.0
Civil engineers	165.4	207.9	217.2	210.3	25.7	31.3	27.1
Electrical engineers	326.7	441.2	479.9	449.2	35.1	46.9	37.5
Industrial engineers	115.9	145.7	159.3	148.3	25.8	37.5	28.0
Mechanical engineers	212.9	273.9	300.0	279.1	28.7	40.9	31.1
Metallurgical engineers	15.4	20.4	22.0	20.8	32.4	42.5	34.7
Mining engineers	6.1	8.4	9.2	8.7	37.7	51.2	42.6
Petroleum engineers	17.9	26.0	27.6	25.8	45.7	54.2	44.3
All other engineers	193.9	214.6	232.5	218.9	10.7	19.9	12.9
Life and physical scientists	253.8	300.2	317.3	305.6	18.2	25.0	20.4
Agricultural scientists	19.8	21.6	22.7	22.1	9.1	14.3	11.5
Biological scientists	44.8	51.2	54.1	52.5	14.1	20.7	17.0
Chemists	93.6	112.9	119.5	115.0	20.6	27.6	22.8
Geologists	39.8	51.7	54.9	52.0	30.1	38.2	30.7
Medical scientists	8.1	9.4	9.7	9.4	15.6	19.4	15.8
Physicists	20.5	23.1	24.4	23.6	12.5	19.0	14.8
All other life and physical scientists	27.1	30.3	32.0	31.1	11.6	18.1	14.5
Mathematical specialists	52.0	61.7	65.8	63.3	18.7	26.5	21.6
Actuaries	7.8	10.9	11.6	11.3	39.5	48.3	44.8
Mathematicians	12.7	14.4	15.2	14.7	13.2	20.0	15.8
Statisticians	26.5	30.9	33.2	31.6	16.7	25.2	19.3
All other mathematical specialists	5.0	5.6	5.8	5.7	10.9	16.3	13.2
Engineering and science technicians [1]	1,267.9	1,578.0	1,700.8	1,610.1	24.5	34.1	27.0
Broadcast technicians	16.5	17.8	18.4	17.8	7.5	11.4	7.7
Civil engineering technicians	24.6	30.7	31.6	31.1	24.8	28.4	26.2
Drafters	321.6	411.1	445.3	418.8	27.9	38.5	30.2
Electrical and electronic technicians	359.5	466.3	513.8	480.3	29.7	42.9	33.6
Industrial engineering technicians	32.4	40.2	43.6	40.8	24.0	34.4	25.7
Mechanical engineering technicians	48.5	60.9	67.1	62.2	25.5	38.2	28.1
Surveyors	61.3	72.9	78.0	75.4	18.8	27.2	22.9
All other engineering and science technicians	403.4	478.0	503.0	483.8	18.5	24.7	19.9
Medical workers, except technicians	2,198.7	2,932.6	3,099.2	2,958.0	33.4	41.0	34.5
Chiropractors	23.0	27.0	29.5	27.8	17.2	28.1	20.7
Dentists [1]	170.7	208.3	222.7	212.4	22.0	30.4	24.4
Dietitians	44.2	60.9	64.5	62.4	37.6	45.8	41.0
Nurses, professional	1,104.0	1,541.5	1,617.4	1,550.9	39.6	46.5	40.5
Optometrists	27.1	32.7	35.5	33.1	21.0	31.3	22.4
Pharmacists	141.2	157.5	169.9	155.2	11.5	20.3	9.9
Physicians, medical and osteopathic [1]	491.1	625.6	664.6	631.2	27.4	35.3	28.5
Podiatrists	12.1	16.1	17.5	16.5	32.6	44.3	35.8
Therapists	149.6	216.5	226.8	218.9	44.7	51.6	46.4
Inhalation therapists	18.3	26.1	27.4	26.3	42.3	49.5	43.1
Manual arts, music, and recreational therapists	23.6	34.6	37.2	35.3	46.7	58.0	49.9
Occupational therapists	19.0	30.9	32.5	31.3	62.7	71.4	64.9
Physical therapists	34.2	51.6	54.5	52.3	50.9	59.4	53.0
Speech and hearing clinicians	35.2	51.6	52.8	51.8	46.6	50.2	47.4
All other therapists	19.3	21.8	22.3	21.9	12.6	15.2	13.4
Veterinarians	35.5	46.6	50.8	49.6	31.1	42.9	39.4
Health technologists and technicians	1,202.6	1,617.5	1,707.9	1,628.0	34.5	42.0	35.4
Cytotechnologists	5.3	7.0	7.7	7.0	32.5	46.9	34.2
Dental hygienists	60.6	84.4	86.2	83.5	39.2	42.3	37.8
Dietetic technicians	5.8	9.1	10.0	9.4	56.6	72.8	62.2
EKG technicians	19.7	26.2	27.3	26.2	33.3	39.0	33.1
Health records technologists	31.6	43.6	45.5	43.6	37.8	43.9	38.0
Licensed practical nurses [1]	521.7	706.9	751.6	717.1	35.5	44.1	37.5
Medical technicians	88.2	119.1	126.7	119.4	35.0	43.6	35.3
Medical laboratory technologists	105.0	140.8	149.4	141.2	34.0	42.2	34.4
Pharmacy helpers	23.1	30.3	31.8	30.2	31.3	37.5	30.7
Physical therapy technicians	11.3	16.7	18.0	17.0	47.9	59.5	50.2
Radiologic and nuclear medicine technicians	14.0	18.2	19.1	18.2	29.9	36.7	30.3

See footnotes at end of table.

Table C-1. Employment, 1980 and projected 1990 (three alternatives), and percent change, 1980-90 in occupations with 1980 employment of 5,000 or higher—Continued

(Thousands)

Occupation	Employment, all industries				Percent change		
	1980	1990 (Low)	1990 (High I)	1990 (High II)	1980-90 (Low)	1980-90 (High I)	1980-90 (High II)
Surgical technicians	31.5	43.9	45.8	43.9	39.3	45.4	39.2
X-ray technicians	92.3	126.4	132.6	126.2	36.8	43.6	36.6
All other health technologists and technicians	192.5	245.0	256.1	245.2	27.3	33.1	27.4
Technicians, except health, science, and engineering	289.4	330.2	349.0	333.8	14.1	20.6	15.3
Airplane pilots	81.7	94.2	100.5	95.6	15.3	23.0	17.0
Air traffic controllers	29.0	33.6	34.3	33.7	16.1	18.5	16.4
Embalmers	11.4	11.6	14.0	12.8	2.0	22.9	13.1
Flight engineers	5.9	6.4	6.8	6.4	8.0	14.7	8.8
Radio operators	5.9	6.8	7.1	6.7	15.2	20.5	14.8
Technical assistants, library	35.5	35.5	35.7	35.4	.1	.6	-.2
Tool programmers, numerical control	11.9	13.8	15.3	14.1	15.8	28.4	17.9
All other technicians, except health, science, and engineering	108.2	128.4	135.4	129.0	18.6	25.1	19.2
Computer specialists	432.8	683.1	733.9	697.2	57.8	69.6	61.1
Computer programmers	228.2	339.9	366.0	346.6	48.9	60.4	51.8
Computer systems analysts	204.6	343.2	367.9	350.6	67.7	79.8	71.4
Social scientists	189.6	242.4	255.4	248.0	27.9	34.7	30.8
Economists	28.8	40.9	43.3	41.5	42.0	50.1	44.0
Financial analysts	14.3	18.5	20.2	19.5	29.7	41.7	37.0
Psychologists [1]	82.5	106.5	111.1	108.5	29.2	34.8	31.6
Sociologists	6.4	7.7	8.1	7.9	20.3	27.4	24.5
Urban and regional planners	23.1	29.4	30.3	29.7	27.5	31.3	28.7
All other social scientists	34.6	39.4	42.4	40.8	13.8	22.6	17.9
Teachers	3,915.5	4,048.1	4,081.6	4,042.6	3.4	4.2	3.2
Adult education teachers	107.4	123.1	125.9	123.4	14.6	17.2	14.8
College and university teachers	457.4	405.1	406.6	404.1	-11.4	-11.1	-11.6
Dance instructors	22.5	25.6	27.2	24.8	13.5	20.5	9.9
Elementary school teachers	1,285.6	1,536.6	1,542.3	1,532.9	19.5	20.0	19.2
Extension service specialists	6.0	5.8	5.8	5.8	-3.1	-2.8	-3.4
Graduate assistants	132.1	108.7	109.1	108.4	-17.7	-17.4	-17.9
Preschool and kindergarten teachers	474.6	570.3	575.5	568.5	20.2	21.3	19.8
Secondary school teachers	1,237.2	1,061.6	1,065.6	1,059.1	-14.2	-13.9	-14.4
Vocational education teachers	27.0	33.2	34.2	33.3	22.8	26.5	23.2
All other teachers	165.6	178.2	189.3	182.4	7.6	14.3	10.1
Selected writers, artists, and entertainers	969.3	1,115.4	1,196.4	1,132.8	15.1	23.4	16.9
Actors	20.8	24.6	26.2	24.7	18.5	25.9	18.7
Athletes	20.5	22.4	24.2	23.6	8.8	17.7	14.7
Commercial artists	120.1	121.9	133.6	126.2	1.5	11.2	5.1
Dancers	6.5	7.8	7.8	7.9	19.9	20.3	21.7
Designers	165.4	189.2	206.1	185.1	14.4	24.6	11.9
Musicians, instrumental	138.2	159.7	165.4	165.4	15.5	19.7	19.6
Painters, artistic	22.4	19.5	21.5	20.3	-12.6	-3.9	-9.3
Photographers	90.7	104.2	112.9	103.7	14.9	24.5	14.4
Public relations specialists	86.6	101.8	108.9	104.3	17.5	25.7	20.4
Radio and television announcers	51.0	65.5	68.1	65.7	28.4	33.5	28.7
Announcers	42.8	54.7	56.9	54.8	27.8	32.9	28.1
Broadcast news analysts	8.2	10.8	11.2	10.8	31.1	36.3	31.3
Reporters and correspondents	57.3	70.0	75.4	72.0	22.2	31.7	25.7
Singers	18.9	21.0	22.5	21.8	11.0	18.9	15.4
Sports instructors	36.4	41.1	43.4	41.3	13.2	19.3	13.5
Writers and editors	118.0	144.5	156.9	148.6	22.5	33.0	25.9
Writers, artists, and entertainers, n.e.c.	8.1	9.4	9.9	9.4	16.8	22.5	16.6
Other professional and technical workers	4,445.7	5,248.7	5,595.9	5,366.9	18.1	25.9	20.7
Accountants and auditors [1]	833.2	1,053.9	1,131.4	1,078.7	26.5	35.8	29.5
Architects	79.5	105.5	112.1	108.4	32.7	41.0	36.3
Assessors	32.4	37.8	38.5	37.9	16.8	18.8	17.0
Audiovisual specialists, education	10.6	10.3	10.3	10.2	-3.4	-3.0	-3.6
Brokers, floor representatives, and security traders	7.8	9.4	10.8	10.4	21.3	38.7	33.5
Buyers, retail and wholesale trade [1]	251.9	296.3	319.6	298.1	17.6	26.9	18.3
Claim examiners, property/casualty insurance	22.0	32.5	33.5	32.8	47.3	52.1	48.6
Claims takers, unemployment benefits	15.2	17.8	18.2	17.9	17.4	19.8	17.8
Clergy	296.0	288.5	309.9	298.3	-2.5	4.7	.8
Cost estimators	85.7	105.8	113.2	108.5	23.5	32.1	26.6
Credit analysts, chief	7.7	9.7	10.4	10.1	25.8	35.0	31.0

See footnotes at end of table.

Table C-1. Employment, 1980 and projected 1990 (three alternatives), and percent change, 1980-90 in occupations with 1980 employment of 5,000 or higher—Continued

(Thousands)

Occupation	Employment, all industries				Percent change		
	1980	1990 (Low)	1990 (High I)	1990 (High II)	1980-90 (Low)	1980-90 (High I)	1980-90 (High II)
Credit analysts	24.1	29.5	32.1	31.1	22.5	33.5	29.4
Directors, religious education and activities	35.8	36.6	39.4	37.9	2.2	9.9	5.8
Employment interviewers	58.2	85.6	95.3	88.3	47.0	63.7	51.8
Foresters	29.5	32.2	33.6	33.0	9.2	13.9	12.0
Insurance investigators	9.7	13.2	14.0	13.5	36.3	43.6	38.8
Judges	19.9	22.9	23.3	22.9	15.0	17.0	15.2
Law clerks	32.7	42.6	48.0	44.3	30.2	46.8	35.4
Lawyers [1]	416.2	523.5	579.9	543.3	25.8	39.4	30.5
Librarians [1]	134.3	138.5	141.1	139.0	3.1	5.1	3.5
Magistrates	10.1	11.8	12.0	11.8	16.7	18.7	16.9
Media buyers	15.1	17.5	19.4	18.3	16.3	28.5	21.6
Paralegal personnel	31.5	65.8	75.3	68.8	108.9	138.8	118.4
Personnel and labor relations specialists	178.2	205.1	217.2	208.2	15.1	21.9	16.8
Purchasing agents and buyers	172.3	199.5	213.8	202.4	15.8	24.1	17.5
Recreation workers, group	130.2	152.3	159.7	156.6	16.9	22.6	20.2
Safety inspectors	5.9	7.4	7.6	7.4	24.8	29.2	25.8
Social workers	344.8	413.8	427.6	422.7	20.0	24.0	22.6
Caseworkers	289.5	342.4	353.9	349.8	18.3	22.3	20.8
Community organization workers	55.3	71.4	73.7	72.9	29.2	33.3	31.9
Special agents, insurance	24.0	29.1	30.2	29.5	21.7	25.9	23.1
Tax examiners, collectors, and revenue agents	54.1	60.3	61.4	60.4	11.5	13.6	11.7
Tax preparers	31.1	46.2	52.8	50.0	48.6	69.8	60.8
Title examiners and abstractors	10.2	17.4	18.0	17.4	70.6	76.1	69.7
Underwriters	76.2	89.5	93.3	89.9	17.5	22.6	18.1
Vocational and educational counselors	207.6	210.5	213.9	211.8	1.4	3.0	2.0
Welfare investigators	11.7	13.6	13.9	13.7	16.0	18.1	16.4
All other professional workers	737.7	814.0	862.5	831.0	10.4	16.9	12.7
Managers, officials, and proprietors	9,355.4	10,562.5	11,344.1	10,760.5	12.9	21.3	15.0
Auto parts department managers	46.7	54.2	58.9	59.0	16.1	26.1	26.4
Auto service department managers	58.1	68.9	74.9	75.2	18.6	28.9	29.4
Construction inspectors, public administration	48.3	60.8	61.9	60.9	26.0	28.2	26.2
Inspectors, except construction, public administration	111.7	125.1	127.5	125.4	12.0	14.1	12.2
Postmasters and mail superintendents	28.3	28.9	30.0	29.1	2.1	5.9	2.9
Railroad conductors	33.2	31.2	34.3	31.5	-6.3	3.3	-5.2
Restaurant, cafe, and bar managers	556.9	642.0	680.0	650.1	15.3	22.1	16.7
Sales managers, retail trade	273.1	323.4	351.2	322.8	18.4	28.6	18.2
Store managers	961.9	1,101.3	1,182.8	1,106.6	14.5	23.0	15.0
Wholesalers	248.5	279.4	306.8	283.6	12.4	23.5	14.1
All other managers	6,988.6	7,847.3	8,435.8	8,016.1	12.3	20.7	14.7
Sales workers	6,821.5	8,112.2	8,763.2	8,204.5	18.9	28.5	20.3
Brokers and market operators, commodities	5.8	8.3	9.5	9.1	42.4	63.7	56.8
Contribution solicitors	6.7	9.0	9.5	9.4	34.4	41.1	40.0
Crating and moving estimators	7.5	10.1	10.5	9.8	33.7	39.7	29.9
Real estate appraisers	35.9	47.1	50.5	48.2	31.1	40.5	34.2
Real estate brokers	38.7	47.9	52.5	48.6	23.9	35.8	25.8
Sales agents and representatives, real estate [1]	291.8	393.7	430.3	400.5	34.9	47.5	37.2
Sales agents and representatives, insurance	327.3	398.6	420.4	405.4	21.8	28.4	23.9
Sales agents and representatives, securities	63.4	80.0	91.6	88.2	26.2	44.4	39.1
Sales clerks	2,879.9	3,359.2	3,598.5	3,359.3	16.6	25.0	16.6
Travel agents and accommodations appraisers	52.1	74.7	79.4	74.9	43.4	52.4	43.8
Vendors	6.9	9.1	9.7	9.2	31.3	40.2	33.1
All other sales workers	3,105.5	3,674.5	4,000.9	3,741.9	18.3	28.8	20.5
Clerical workers	18,863.8	22,417.6	23,917.0	22,720.5	18.8	26.8	20.4
Adjustment clerks	37.3	45.4	47.6	45.7	21.7	27.5	22.4
Admissions evaluators	5.6	5.4	5.4	5.4	-3.1	-2.8	-3.4
Bank tellers	480.4	600.8	619.3	605.6	25.1	28.9	26.1
New accounts tellers	52.7	64.9	67.1	65.8	23.1	27.3	24.9
Tellers	427.7	535.9	552.3	539.9	25.3	29.1	26.2
Bookkeepers and accounting clerks	1,714.5	1,974.8	2,123.4	2,006.0	15.2	23.8	17.0
Accounting clerks	740.0	833.0	892.7	843.2	12.6	20.6	14.0
Bookkeepers, hand	974.6	1,141.8	1,230.7	1,162.8	17.2	26.3	19.3
Brokerage clerks	12.9	16.7	19.3	18.6	29.6	49.7	44.6
Car rental clerks	16.8	21.0	21.6	20.7	25.0	28.3	23.0
Cashiers	1,592.5	2,044.6	2,163.4	2,068.7	28.4	35.8	29.9
Checking clerks	15.9	20.3	20.9	20.4	27.4	31.5	28.1
Circulation clerks	10.7	12.7	13.6	13.0	18.4	27.5	21.9

See footnotes at end of table.

Table C-1. Employment, 1980 and projected 1990 (three alternatives), and percent change, 1980-90 in occupations with 1980 employment of 5,000 or higher—Continued

(Thousands)

Occupation	Employment, all industries				Percent change		
	1980	1990 (Low)	1990 (High I)	1990 (High II)	1980-90 (Low)	1980-90 (High I)	1980-90 (High II)
Claims adjusters	69.8	94.7	97.9	95.1	35.7	40.4	36.3
Claims clerks	67.6	92.3	95.8	92.8	36.5	41.6	37.2
Claims examiners, insurance	40.3	57.7	58.9	57.9	43.0	46.1	43.8
Clerical supervisors	429.6	518.7	552.7	526.0	20.8	28.7	22.4
Collectors, bill and account	88.7	107.9	119.0	112.8	21.6	34.1	27.1
Court clerks	26.0	30.4	30.9	30.4	16.9	19.0	17.2
Credit authorizers	20.8	25.6	27.0	26.3	23.1	29.9	26.5
Credit clerks, banking and insurance	50.4	61.9	68.0	66.0	22.7	34.8	31.0
Credit reporters	17.0	21.4	23.7	22.3	25.5	39.2	30.8
Customer service representatives, printing and publishing	7.0	7.9	8.6	8.1	13.4	23.2	16.8
Desk clerks, bowling floor	15.4	15.4	16.4	16.9	.4	6.4	10.2
Desk clerks, except bowling floor	82.3	94.1	106.4	95.3	14.3	29.2	15.8
Dispatchers, police, fire, and ambulance	51.0	59.6	60.7	59.7	17.0	19.0	17.2
Dispatchers, vehicle, service, or work	91.7	108.4	115.5	107.4	18.2	26.0	17.2
Eligibility workers, welfare	32.6	38.4	39.2	38.6	17.8	20.0	18.3
File clerks	270.9	325.0	346.2	329.1	19.9	27.8	21.5
General clerks, office	2,394.7	2,772.2	2,972.4	2,811.4	15.8	24.1	17.4
In-file operators	5.4	6.7	7.9	7.1	23.8	46.1	32.2
Insurance checkers	12.9	15.4	15.8	15.4	18.9	22.1	19.4
Insurance clerks, except medical	9.7	11.0	11.5	11.3	13.9	19.0	17.5
Insurance clerks, medical	69.0	92.8	97.4	92.2	34.5	41.2	33.7
Library assistants	119.0	123.3	124.7	123.3	3.7	4.8	3.7
Loan closers	24.1	31.1	32.7	31.9	29.2	35.8	32.3
Mail carriers, Postal Service	241.5	260.1	269.7	262.0	7.7	11.7	8.5
Mail clerks	81.2	94.5	99.4	96.2	16.4	22.4	18.5
Marking clerks, trade	43.5	53.8	56.8	54.8	23.8	30.6	26.1
Messengers	51.6	59.9	64.1	61.6	16.1	24.4	19.5
Meter readers, utilities	30.0	32.4	37.7	32.5	7.8	25.6	8.2
Mortgage closing clerks	21.8	24.7	26.7	26.4	13.3	22.4	21.3
Office machine operators	914.5	1,107.6	1,183.5	1,121.4	21.1	29.4	22.6
Bookkeeping and billing operators	233.8	283.5	301.1	282.5	21.2	28.8	20.9
Bookkeeping, billing machine operators	176.7	211.8	228.2	211.7	19.9	29.1	19.8
Proof machine operators	47.5	59.8	60.9	59.2	25.9	28.2	24.5
Transit clerks	9.6	11.8	12.0	11.7	23.5	25.7	22.3
Computer, peripheral equipment operators	233.2	386.8	412.0	393.9	65.8	76.6	68.9
Computer operators [1]	184.6	316.7	338.2	323.0	71.6	83.2	75.0
Peripheral EDP equipment operators	48.7	70.1	73.8	70.9	44.0	51.6	45.7
Duplicating machine operators	33.9	38.4	41.1	39.1	13.4	21.3	15.3
Keypunch operators	324.7	293.0	315.8	297.8	-9.8	-2.8	-8.3
Tabulating machine operators	5.1	6.0	6.4	6.1	17.3	25.1	19.1
All other office machine operators	83.7	100.0	107.2	101.9	19.4	28.1	21.7
Order clerks	250.2	289.0	316.0	288.1	15.5	26.3	15.1
Payroll and timekeeping clerks	178.7	210.9	226.2	214.2	18.0	26.6	19.9
Personnel clerks	94.8	111.4	117.5	112.7	17.5	23.9	18.8
Policy change clerks	26.6	31.6	33.1	31.7	19.0	24.5	19.4
Postal clerks	316.3	309.5	320.9	311.8	-2.2	1.5	-1.4
Procurement clerks	40.3	46.5	50.0	47.0	15.5	24.0	16.6
Production clerks	201.1	235.4	257.9	239.6	17.1	28.3	19.2
Proofreaders	19.8	22.2	24.2	23.1	12.5	22.3	16.9
Rate clerks, freight	11.2	13.9	14.4	13.4	24.1	29.2	19.9
Raters	56.1	63.2	65.9	63.5	12.6	17.4	13.2
Real estate clerks	15.6	22.1	23.8	22.0	41.6	52.1	40.5
Receptionists	401.5	499.0	533.0	504.8	24.3	32.7	25.7
Reservation agents	56.6	55.2	58.8	55.6	-2.4	3.9	-1.6
Safe deposit clerks	10.6	13.9	14.3	13.9	31.0	34.1	30.9
Secretaries, stenographers, and typists	3,817.4	4,680.9	4,996.2	4,760.2	22.6	30.9	24.7
Secretaries	2,469.0	3,168.7	3,392.0	3,227.5	28.3	37.4	30.7
Stenographers	281.2	257.9	274.6	261.7	-8.3	-2.3	-6.9
Typists	1,067.2	1,254.3	1,329.6	1,271.0	17.5	24.6	19.1
Service clerks	22.9	28.8	30.3	29.8	25.8	32.4	30.0
Shipping and receiving clerks	390.0	448.7	488.1	452.0	15.0	25.1	15.9
Shipping packers	346.1	397.8	431.2	400.9	15.0	24.6	15.8
Statement clerks	32.6	43.8	44.9	43.8	34.2	37.8	34.3
Statistical clerks	85.2	94.6	100.4	95.7	11.0	17.9	12.3
Stock clerks, stockroom and warehouse	821.6	963.7	1,042.7	977.3	17.3	26.9	18.9

See footnotes at end of table.

Table C-1. Employment, 1980 and projected 1990 (three alternatives), and percent change, 1980-90 in occupations with 1980 employment of 5,000 or higher—Continued

(Thousands)

Occupation	Employment, all industries				Percent change		
	1980	1990 (Low)	1990 (High I)	1990 (High II)	1980-90 (Low)	1980-90 (High I)	1980-90 (High II)
Survey workers	45.6	47.7	51.7	49.2	4.7	13.5	7.9
Switchboard operators/receptionists	233.4	275.7	297.9	281.7	18.1	27.6	20.7
Teachers' aides, except monitors	415.4	493.3	496.5	491.7	18.8	19.5	18.4
Telephone advertisement takers, newspapers	9.6	11.3	12.3	11.7	17.8	27.7	21.8
Telegraph operators	15.3	13.5	15.0	13.8	-11.8	-2.4	-10.0
Telephone operators	337.3	350.9	386.3	356.3	4.0	14.5	5.6
Switchboard operators	183.9	192.9	207.2	196.3	4.9	12.6	6.7
Central office operators	110.0	112.6	127.7	114.0	2.4	16.1	3.7
Directory assistance operators	38.0	39.7	45.0	40.2	4.5	18.4	5.8
All other telephone operators	5.4	5.7	6.4	5.8	5.0	19.0	6.4
Ticket agents	53.1	50.8	53.9	51.2	-4.2	1.6	-3.4
Title searchers	7.0	12.4	12.8	12.3	78.5	83.4	76.6
Town clerks	28.4	33.3	33.9	33.3	17.3	19.3	17.5
Traffic agents	18.2	21.8	22.9	21.3	19.8	25.8	17.1
Traffic clerks	6.7	8.8	9.1	8.8	31.5	36.9	31.8
Transportation agents	21.3	22.0	23.3	22.1	3.0	9.4	3.8
Travel counselors, auto club	8.4	9.9	10.8	10.1	16.9	28.0	19.7
Weighers	35.3	41.5	44.7	41.9	17.5	26.5	18.8
Worksheet clerks	11.6	12.5	12.6	12.5	7.7	9.2	8.2
Yard clerks	5.6	4.5	5.0	4.6	-18.6	-10.2	-17.6
All other clerical workers	1,150.0	1,339.1	1,437.1	1,360.2	16.4	25.0	18.3
Craft and related workers	12,369.2	14,566.9	15,756.1	14,866.3	17.8	27.4	20.2
Construction craft workers	3,317.1	3,981.2	4,276.6	4,076.0	20.0	28.9	22.9
Air-hammer operators	11.9	14.6	16.4	15.0	22.5	37.8	25.7
Brickmasons	145.9	204.5	220.5	211.2	40.2	51.2	44.8
Carpenters	969.5	1,142.7	1,231.0	1,186.4	17.9	27.0	22.4
Carpet cutters and layers	53.2	65.5	72.6	67.6	23.2	36.6	27.1
Ceiling tile installers and floor layers	26.6	34.8	38.4	35.9	31.0	44.2	35.1
Concrete and terrazzo finishers	112.6	154.1	166.0	158.9	36.9	47.4	41.1
Drywall installers and lathers	95.9	124.3	134.2	127.5	29.6	39.9	33.0
Drywall applicators	52.3	70.5	76.1	72.5	34.7	45.6	38.6
Lathers	11.9	11.4	12.2	11.7	-4.4	2.9	-1.7
Tapers	31.7	42.5	45.8	43.4	33.9	44.4	36.7
Electricians	560.3	669.4	717.0	684.1	19.5	28.0	22.1
Fitters, pipelaying	8.8	10.6	11.6	10.8	19.3	30.7	22.0
Glaziers	38.4	47.2	50.4	48.8	23.0	31.3	27.1
Highway maintenance workers	186.0	211.2	214.9	211.6	13.5	15.5	13.7
Insulation workers	45.4	59.3	63.4	60.9	30.5	39.6	34.1
Painters, construction and maintenance	382.4	435.8	476.6	429.3	14.0	24.6	12.3
Paperhangers	21.1	24.3	26.9	24.4	15.6	27.8	15.8
Plasterers	23.6	25.6	27.7	26.4	8.5	17.4	11.9
Plumbers and pipefitters	406.7	488.1	521.7	500.6	20.0	28.3	23.1
Refractory materials repairers	7.7	9.3	9.5	9.2	19.7	22.7	19.4
Roofers	112.6	129.6	139.4	133.6	15.2	23.8	18.7
Stonemasons	9.1	10.0	10.7	10.4	10.0	17.5	14.8
Structural steel workers	74.8	87.6	92.6	89.8	17.2	23.8	20.1
Tile setters	20.2	27.6	29.9	28.4	36.2	48.0	40.4
Mechanics, repairers, and installers	3,936.7	4,752.4	5,142.8	4,850.0	20.7	30.6	23.2
Air-conditioning, heating, and refrigeration mechanics	179.5	214.7	231.4	217.4	19.7	28.9	21.2
Aircraft mechanics	108.5	125.0	132.7	126.1	15.2	22.3	16.2
Auto body repairers	153.4	188.8	200.7	192.6	23.1	30.8	25.5
Auto seat cover and top installers	9.4	8.2	8.4	7.7	-12.7	-10.1	-18.1
Automotive mechanics	845.7	1,052.1	1,123.8	1,081.9	24.4	32.9	27.9
Auto repair service estimators	11.4	14.2	15.4	15.7	24.7	35.1	37.9
Bicycle repairers	12.4	15.7	17.3	15.1	27.1	39.7	22.5
Coin machine servicers and repairers	26.7	29.2	31.0	24.6	9.2	16.1	-8.0
Data processing machine mechanics	83.0	160.4	176.3	166.7	93.2	112.4	100.8
Diesel mechanics	173.5	214.4	227.6	214.5	23.5	31.1	23.6
Electrical instrument and tool repairers	9.1	10.7	11.7	11.1	16.8	27.7	21.6
Electric motor repairers	20.2	26.9	34.5	32.1	33.2	70.6	58.6
Electric powerline installers and repairers	171.6	187.0	212.0	189.8	9.0	23.6	10.6
Cable splicers	43.7	46.1	52.1	46.6	5.4	19.3	6.7
Line installers and repairers	120.2	132.7	150.3	134.8	10.4	25.1	12.2
Troubleshooters, powerline	7.7	8.2	9.6	8.3	6.6	24.5	7.9
Engineering equipment mechanics	92.0	104.0	112.3	107.6	13.1	22.1	17.0
Farm equipment mechanics	24.8	29.9	32.4	31.4	20.9	31.0	26.7

See footnotes at end of table.

Table C-1. Employment, 1980 and projected 1990 (three alternatives), and percent change, 1980-90 in occupations with 1980 employment of 5,000 or higher—Continued

(Thousands)

Occupation	Employment, all industries				Percent change		
	1980	1990 (Low)	1990 (High I)	1990 (High II)	1980-90 (Low)	1980-90 (High I)	1980-90 (High II)
Gas and electric appliance repairers	60.2	67.7	75.5	67.7	12.4	25.3	12.4
Household appliance installers	17.0	22.0	23.9	22.8	29.0	40.4	33.5
Hydroelectric machine mechanics	13.0	13.9	15.8	14.0	7.6	22.1	8.2
Instrument repairers	37.6	41.5	44.9	41.9	10.5	19.6	11.6
Knitting machine fixers	10.6	11.1	12.2	10.8	5.4	14.9	2.0
Laundry machine mechanics	5.4	4.5	5.4	4.9	-17.4	-.1	-8.8
Locksmiths	11.4	15.6	18.8	17.7	37.2	65.7	55.6
Loom fixers	18.0	16.2	16.4	16.1	-9.9	-8.4	-10.4
Maintenance mechanics	348.1	411.0	439.5	418.9	18.1	26.3	20.3
Maintenance repairers, general utility	651.4	785.0	845.4	794.3	20.5	29.8	22.0
Marine mechanics and repairers	9.9	10.6	11.4	10.8	7.1	15.2	9.4
Millwrights	91.0	107.9	114.3	109.1	18.5	25.6	19.9
Mine machinery mechanics	18.1	26.4	29.9	28.1	46.0	65.4	55.3
Mobile home repairers	5.6	6.7	7.5	7.1	20.2	34.0	26.6
Musical instrument repairers	14.4	17.2	18.9	18.5	19.4	31.5	28.8
Office machine and cash register servicers	55.4	88.5	96.1	91.4	59.8	73.5	65.0
Pinsetter mechanics, automatic	6.5	6.6	6.9	7.2	.4	6.4	10.2
Radio and television repairers	83.1	109.1	118.6	114.3	31.3	42.8	37.6
Railroad car repairers	30.0	24.4	26.9	24.7	-18.5	-10.1	-17.5
Railroad signal and switch maintainers	5.7	4.7	5.1	4.7	-18.6	-10.2	-17.6
Section repairers and setters	13.6	14.0	14.4	13.7	3.0	6.1	1.3
Sewing machine mechanics	12.2	14.2	15.6	14.5	16.4	28.3	16.6
Shoe repairers	15.5	17.2	17.8	16.8	10.8	15.1	8.4
Telephone installers and repairers	247.6	265.9	301.5	269.6	7.4	21.8	8.9
Cable repairers	10.1	10.8	12.2	10.9	6.2	20.7	7.7
Cable installers	7.1	9.2	9.5	8.4	15.6	33.6	19.1
Central office repairers	50.8	47.8	54.2	48.4	-6.0	6.6	-4.8
Frame wirers	13.3	12.5	14.1	12.6	-6.0	6.5	-4.8
Installers, repairers, and section maintainers	75.0	86.5	98.0	87.7	15.4	30.7	16.9
Station installers	59.4	68.4	77.5	69.2	15.1	30.5	16.5
Trouble locators, test desk	19.4	18.3	20.7	18.5	-5.7	6.9	-4.5
All other telephone installers and repairers	12.5	13.6	15.3	13.8	8.4	22.4	10.4
Water meter installers	6.1	7.2	7.3	7.2	17.2	19.3	17.5
All other mechanics, repairers, and installers	224.0	257.4	279.8	264.1	14.9	24.9	17.9
Metalworking craft workers, except mechanics	936.1	1,069.7	1,179.6	1,094.2	14.3	26.0	16.9
Blacksmiths	5.9	5.4	6.0	5.6	-8.6	.8	-6.2
Boilermakers	43.9	48.3	52.7	50.1	10.1	20.1	14.2
Coremakers, hand, bench, and floor	9.3	10.3	10.9	10.3	10.8	17.9	11.4
Forging press operators	8.9	10.8	12.0	11.1	21.6	34.6	24.9
Header operators	5.4	6.9	7.4	7.0	27.6	37.9	30.7
Heat treaters, annealers, and temperers	25.2	29.5	32.0	29.6	17.0	26.8	17.6
Layout markers, metal	21.3	24.3	27.2	24.8	13.9	28.0	16.7
Machine tool setters, metalworking	55.5	65.9	73.7	67.3	18.6	32.7	21.1
Machinists [1]	281.9	326.7	362.3	335.4	15.9	28.5	19.0
Molders, metal	39.7	44.3	47.0	44.3	11.6	18.5	11.6
Molders, bench and floor	13.0	14.5	15.5	14.6	11.9	19.6	12.5
Molders, machine	19.2	21.6	23.1	21.7	12.5	20.6	13.5
All other molders, metal	7.5	8.2	8.3	7.9	8.9	11.4	5.5
Patternmakers, metal	7.9	9.4	10.3	9.5	19.0	29.6	20.1
Punch press setters, metal	19.2	23.3	25.9	23.9	21.4	34.6	24.1
Rolling mill operators and helpers	10.8	12.4	12.7	12.4	15.4	17.5	14.5
Shear and slitter setters	5.5	6.6	7.2	6.7	20.1	32.0	22.1
Sheet-metal workers and tinsmiths	217.8	252.1	270.7	258.1	15.7	24.3	18.5
Tool-and-die makers	166.0	179.1	206.4	183.6	7.9	24.4	10.6
All other metalworking craft workers	11.9	14.4	15.2	14.5	21.4	28.0	22.6
Printing trades craft workers	408.0	429.8	463.0	444.9	5.3	13.5	9.0
Bookbinders, hand and machine	23.7	26.4	28.7	27.4	11.4	21.2	15.9
Bindery machine setters	6.5	7.1	7.7	7.4	10.4	20.1	14.8
Compositors and typesetters	127.8	115.5	124.8	119.0	-9.6	-2.3	-6.9
Etchers and engravers	14.7	16.9	18.0	17.1	14.8	22.2	16.1
Photoengravers and lithographers	55.1	68.6	74.2	71.5	24.4	34.6	29.7
Camera operators, printing	22.2	29.3	31.7	30.5	32.1	43.0	37.6
Photoengravers	10.3	9.9	10.6	10.3	-4.7	3.0	-.8
Strippers, printing	22.6	29.5	31.9	30.8	30.1	40.9	35.8

See footnotes at end of table.

Table C-1. Employment, 1980 and projected 1990 (three alternatives), and percent change, 1980-90 in occupations with 1980 employment of 5,000 or higher—Continued

(Thousands)

Occupation	Employment, all industries				Percent change		
	1980	1990 (Low)	1990 (High I)	1990 (High II)	1980-90 (Low)	1980-90 (High I)	1980-90 (High II)
Press and plate printers	178.3	194.2	208.3	201.3	9.0	16.9	12.9
Letter press operators	38.0	37.0	40.0	38.6	-2.8	5.1	1.4
Offset lithographic press operators	80.8	92.3	99.4	96.1	14.3	23.0	19.0
Platemakers	13.8	15.0	16.2	15.6	8.4	17.3	12.9
Press operators and plate printers	36.1	39.9	41.9	40.5	10.5	15.9	12.2
All other press and plate printers	9.5	10.0	10.8	10.5	6.1	14.7	10.8
Other craft and related workers	3,771.4	4,333.8	4,694.0	4,401.3	14.9	24.5	16.7
Auxiliary equipment operators	8.3	8.0	9.2	8.0	-3.7	11.1	-3.2
Bakers	63.2	72.2	76.5	73.9	14.2	20.9	16.9
Blue-collar worker supervisors	1,297.0	1,503.1	1,624.8	1,526.3	15.9	25.3	17.8
Cabinetmakers	70.7	89.3	95.1	88.1	26.2	34.5	24.6
Control room operators, steam	7.6	7.2	8.4	7.3	-5.4	9.7	-4.3
Crane, derrick, and hoist operators	126.6	144.3	154.3	146.9	14.1	21.9	16.0
Dental laboratory technicians	53.4	68.9	79.4	70.6	29.0	48.7	32.3
Food shapers, hand	5.1	4.5	4.9	4.7	-11.4	-5.2	-8.6
Furniture finishers	22.1	26.0	28.6	26.4	17.6	29.4	19.7
Furniture upholsterers	34.8	35.9	40.0	37.1	3.4	15.0	6.7
Glass installers	5.7	7.9	8.1	7.3	38.8	41.8	28.6
Heavy equipment operators	452.8	531.3	582.4	545.0	17.3	28.6	20.3
Inspectors	472.5	544.2	595.1	553.9	15.2	26.0	17.2
Jewelers and silversmiths	27.8	32.2	35.3	31.2	15.9	27.2	12.3
Lens grinders	10.9	12.6	14.0	13.2	14.9	28.4	20.6
Locomotive engineers	46.8	46.7	51.2	47.3	-.2	9.3	.9
Locomotive engineer helpers	11.0	4.4	4.8	4.4	-60.1	-56.0	-59.6
Log inspectors, graders, and scalers	5.3	5.6	5.7	5.5	5.5	7.0	3.7
Logging tractor operators	25.8	15.4	16.1	15.7	-40.1	-37.7	-39.0
Lumber graders	5.8	6.2	6.2	6.0	8.5	8.4	3.4
Machine setters, paper goods	10.0	10.1	10.3	10.2	1.3	3.6	2.2
Machine setters, plastic materials	7.4	9.6	9.8	9.4	28.8	31.3	26.7
Machine setters, woodworking	5.1	6.4	6.5	6.1	24.4	27.8	19.3
Merchandise displayers and window trimmers	26.1	30.9	33.2	31.7	18.5	27.0	21.3
Millers	6.5	7.2	7.7	7.2	10.4	17.9	11.0
Motion picture projectionists	19.3	19.7	19.5	19.2	1.9	.7	-.8
Opticians	33.4	42.1	45.7	40.8	26.1	36.9	22.5
Oil pumpers	15.1	16.1	17.0	15.8	6.7	12.3	4.6
Patternmakers, wood	7.4	8.7	9.6	8.8	17.9	29.5	19.1
Power station operators	17.9	19.4	21.6	19.6	8.4	20.5	9.3
Pumpers, head	8.4	8.8	9.2	8.6	4.2	9.7	2.1
Pumping station operators, waterworks	5.2	6.4	6.7	6.4	21.4	27.7	21.7
Sewage plant operators	41.2	43.3	44.5	43.4	5.0	8.0	5.3
Shipfitters	17.1	20.8	23.1	21.4	21.7	35.2	25.5
Ship engineers	9.8	10.4	10.8	9.8	6.1	9.6	-.6
Stationary engineers	62.3	71.0	75.0	71.6	14.0	20.3	14.9
Tailors	62.8	75.5	82.6	77.1	20.3	31.5	22.8
Testers	105.7	119.8	129.5	121.8	13.3	22.5	15.2
Upholsterers	20.9	26.2	28.7	26.5	25.6	37.7	26.9
Upholstery cutters	6.8	8.4	9.1	8.5	23.2	33.9	25.2
Upholstery workers, n.e.c.	15.5	18.7	20.3	19.0	20.9	30.9	22.7
Veneer graders	5.1	6.3	5.9	5.3	22.4	14.5	3.9
Watchmakers	12.3	12.4	13.9	12.2	.9	12.9	-.9
Water treatment plant operators	29.7	34.9	36.3	35.0	17.4	22.3	17.7
All other craft and related workers	463.1	529.9	572.6	539.3	14.4	23.6	16.4
Operatives	14,206.1	16,304.9	17,595.8	16,487.3	14.8	23.9	16.1
Assemblers	1,668.4	1,989.5	2,183.1	2,021.1	19.2	30.9	21.1
Aircraft structure and surfaces assemblers	25.4	26.7	29.4	27.2	5.2	15.8	7.0
Electrical and electronic assemblers	233.1	272.7	299.1	276.5	17.0	28.3	18.6
Electro-mechanical equipment assemblers	58.4	69.3	78.1	70.5	18.8	33.9	20.9
Instrument makers and assemblers	24.8	29.2	33.1	28.9	17.7	33.2	16.4
Machine assemblers	103.0	124.2	144.0	126.9	20.6	39.8	23.2
All other assemblers	1,219.3	1,462.2	1,593.6	1,486.1	19.9	30.7	21.9
Bindery operatives	86.6	78.9	85.6	81.9	-8.9	-1.1	-5.3
Bindery workers, assembly	43.7	39.2	42.6	40.8	-10.4	-2.6	-6.8

See footnotes at end of table.

Table C-1. Employment, 1980 and projected 1990 (three alternatives), and percent change, 1980-90 in occupations with 1980 employment of 5,000 or higher—Continued

(Thousands)

Occupation	Employment, all industries				Percent change		
	1980	1990 (Low)	1990 (High I)	1990 (High II)	1980-90 (Low)	1980-90 (High I)	1980-90 (High II)
Bindery workers, stitching	10.4	10.1	11.0	10.5	-3.5	5.0	0.2
All other bindery operatives	32.4	29.6	32.1	30.7	-8.6	-1.1	-5.2
Laundry, drycleaning, and pressing machine operators	324.6	355.6	403.9	375.2	9.6	24.4	15.6
Drycleaners, hand and machine	14.6	13.9	16.8	15.3	-5.1	15.0	4.8
Folders, laundry	15.8	13.0	15.8	14.4	-17.7	.1	-8.8
Laundry operators, small establishment	40.0	47.6	53.2	49.4	19.2	33.2	23.6
Markers, classifiers, and assemblers	18.1	15.9	18.4	17.2	-12.0	1.8	-5.0
Pressers, hand	29.3	32.3	36.0	33.4	10.1	22.5	13.8
Pressers, machine	53.3	55.8	64.7	59.2	4.6	21.4	11.1
Pressers, machine laundry	67.5	73.8	83.6	78.0	9.3	23.9	15.5
Rug cleaners, hand and machine	6.7	5.5	6.7	6.1	-17.3	.6	-8.4
Shapers and pressers	6.0	6.5	7.3	6.7	9.1	21.9	11.6
Spotters, drycleaning and washable materials	7.2	5.9	7.2	6.6	-17.8	-.1	-9.0
Washers, machine, and starchers	59.1	78.6	86.6	81.8	32.9	46.4	38.4
All other laundry, drycleaning, and pressing machine operators	6.9	6.7	7.5	7.1	-2.8	10.0	3.1
Meat cutters and butchers	66.3	67.3	71.7	66.5	1.4	8.2	.3
Boners, meat	17.0	17.7	18.8	17.3	4.0	10.7	1.5
Boners, poultry	10.3	10.8	11.5	10.6	4.1	10.7	2.0
Butchers, all-around	22.9	23.8	25.3	23.1	3.9	10.7	1.2
Carcass splitters	6.8	7.0	7.5	6.8	4.0	10.6	1.1
Fish cleaners, hand, and butchers, fish	9.3	8.0	8.7	8.7	-14.2	-7.2	-6.9
Metalworking operatives	1,652.8	1,970.4	2,211.2	2,025.4	19.2	33.8	22.5
Dip platers, nonelectrolytic	13.1	15.6	16.7	15.8	19.1	27.3	20.8
Drill press and boring machine operators	124.5	147.6	167.1	151.3	18.6	34.2	21.6
Electroplators	37.5	44.1	47.7	45.1	17.7	27.3	20.4
Furnace chargers	5.5	6.7	6.8	6.6	20.3	22.4	19.7
Furnace operators, cupola tenders	16.9	19.8	20.8	19.8	17.2	23.4	17.1
Grinding and abrading machine operators, metal	131.4	153.9	173.4	157.2	17.1	32.0	19.7
Heaters, metal	6.5	7.7	8.3	7.9	18.9	27.1	20.8
Lathe machine operators, metal	156.6	186.3	210.2	191.3	19.0	34.2	22.1
Machine-tool operators, combination	170.7	199.9	226.2	205.9	17.1	32.5	20.6
Machine-tool operators, numerical control	52.7	61.2	69.7	62.8	16.1	32.3	19.2
Machine-tool operators, tool-room	38.7	45.6	52.1	46.7	17.9	34.6	20.6
Milling and planing machine operators	72.4	83.1	95.4	85.6	14.8	31.9	18.3
Pourers, metal	15.3	19.4	20.3	19.4	26.7	32.7	26.9
Power brake and bending machine operators, metal	40.1	48.4	53.9	49.4	21.0	34.5	23.3
Punch press operators, metal	182.9	217.4	240.4	222.3	18.8	31.4	21.5
Welders and flamecutters	572.8	696.2	764.3	720.8	21.6	36.9	25.8
All other metalworking operatives	15.2	17.5	17.9	17.3	15.2	17.6	13.9
Mine operatives, n.e.c.	210.3	238.5	258.3	242.7	13.4	22.8	15.4
Continuous mining machine operators	8.5	13.1	15.1	14.2	54.5	77.4	66.8
Derrick operators, petroleum and gas	16.7	15.9	16.7	15.7	-4.7	.0	-6.0
Gagers	7.3	7.6	7.9	7.4	3.0	7.7	.4
Loading machine operators	7.1	9.3	10.4	9.7	31.7	46.9	36.8
Mill and grinder operators, minerals	12.0	13.3	14.0	13.1	10.6	16.4	8.9
Roof bolters	12.7	17.7	20.3	19.1	39.8	60.3	50.9
Roustabouts	79.8	79.7	83.7	78.5	.0	4.9	-1.5
Service unit operators, oil well	12.0	12.3	12.9	12.1	2.3	7.3	.9
Shuttle car operators	13.3	18.2	20.9	19.6	37.2	57.3	47.8
Well pullers	6.6	6.8	7.1	6.7	3.4	8.5	1.8
All other mine operatives, n.e.c.	34.5	44.6	49.4	46.7	29.3	43.3	35.3
Packing and inspecting operatives	919.2	980.7	1,040.7	993.0	6.7	13.2	8.0
Baggers	235.1	237.7	249.9	242.3	1.1	6.3	3.0
Bundlers	19.0	20.6	22.8	21.1	8.3	19.6	10.9
Cloth graders	8.4	8.5	8.7	8.4	1.8	4.6	.7
Graders, food and skins	6.6	6.6	7.1	6.9	1.4	7.9	4.9
Production packagers	608.9	660.6	704.3	669.3	8.5	15.7	9.9
Selectors, glassware	30.1	34.8	35.4	33.2	15.5	17.7	10.1
All other packing and inspecting operatives	11.1	11.8	12.4	11.9	5.9	11.2	7.2
Painters, manufactured articles	161.8	204.9	221.6	205.9	26.6	36.9	27.3
Painters, automotive	40.7	56.2	58.6	55.1	38.1	43.9	35.4
Decorators, hand	5.4	7.1	7.6	7.3	31.8	40.2	35.5
Rubbers	7.3	9.5	10.1	9.5	29.9	39.0	30.3

See footnotes at end of table.

Table C-1. Employment, 1980 and projected 1990 (three alternatives), and percent change, 1980-90 in occupations with 1980 employment of 5,000 or higher—Continued

(Thousands)

Occupation	Employment, all industries				Percent change		
	1980	1990 (Low)	1990 (High I)	1990 (High II)	1980-90 (Low)	1980-90 (High I)	1980-90 (High II)
Painters, production	108.4	132.1	145.3	134.0	21.8	34.0	23.6
Sawyers	83.1	98.2	102.2	97.5	18.2	22.9	17.3
Cut-off-saw operators, lumber	17.5	21.6	22.1	20.8	23.6	26.0	19.1
Edgers, automatic and pony	6.0	6.5	6.6	6.3	8.2	9.6	5.4
Head sawyers	6.5	7.1	7.2	6.9	8.9	10.1	6.1
Ripsaw operators	12.4	15.3	15.8	14.9	23.7	28.2	20.7
Sawyers, metal	19.1	22.9	25.4	23.3	19.9	32.6	21.9
Trim-saw operators	6.5	7.3	7.3	7.0	12.1	12.3	8.0
All other sawyers	15.1	17.5	17.8	18.2	15.7	18.0	20.1
Sewers and stitchers	895.3	967.5	1,065.8	987.3	8.1	19.0	10.3
Menders	9.8	9.5	11.4	10.4	-3.2	16.8	6.3
Sewing machine operator:							
Regular equipment, garment	602.0	633.9	702.0	647.4	5.3	16.6	7.5
Special equipment, garment	87.0	96.3	106.4	98.5	10.8	22.4	13.2
Regular equipment, nongarment	137.7	161.8	175.0	164.0	17.5	27.1	19.1
Special equipment, nongarment	38.9	45.5	49.0	46.1	16.9	25.9	18.3
All other sewers and stitchers	15.1	15.3	16.1	15.6	1.1	6.2	3.4
Textile operatives	380.2	399.0	419.3	395.9	4.9	10.3	4.1
Battery loaders	8.3	6.4	6.5	6.4	-22.5	-21.4	-22.7
Beam warper tenders and beamers	10.0	9.4	9.9	9.6	-5.9	-.6	-4.1
Card tenders and comber tenders	9.9	10.3	10.8	10.1	4.2	9.0	2.6
Creelers, yarn	17.6	19.6	20.7	19.7	11.3	17.8	11.8
Doffers	24.3	24.4	25.2	24.3	.3	3.7	-.1
Drawing frame and gill box tenders	7.7	8.5	8.7	8.3	10.1	12.8	8.0
Folders, hand	26.2	29.4	32.3	29.5	12.1	23.1	12.7
Knitting machine operators	22.0	23.4	25.5	22.8	6.2	15.7	3.5
Seamless hosiery knitters	5.2	5.5	6.0	5.3	5.0	15.1	1.4
Slubber tenders	5.5	5.5	5.6	5.4	-1.1	1.3	-2.7
Spinners, frame	30.6	31.6	32.4	31.0	3.2	6.0	1.2
Spooler operators, automatic	7.6	6.9	7.1	6.9	-9.4	-7.3	-10.3
Texturizers and crimp setters	7.5	8.7	9.1	8.8	15.2	20.9	17.0
Turners	10.3	11.0	12.2	11.3	6.9	18.0	9.2
Twister tenders	14.4	17.4	18.1	17.2	21.0	25.9	19.9
Weavers	35.2	32.5	33.4	32.4	-7.5	-5.1	-7.8
Winder operators, automatic	13.4	15.6	16.1	15.2	16.2	20.0	13.8
Yarn winders	19.9	23.7	24.5	23.4	19.1	23.3	17.5
All other textile operatives	85.9	89.0	93.5	88.3	3.6	8.9	2.8
Transportation equipment operatives	3,527.6	4,153.5	4,430.1	4,141.4	17.7	25.6	17.4
Ambulance drivers and ambulance attendants	31.3	41.4	42.4	40.1	32.2	35.4	28.2
Bus drivers	285.3	325.0	328.3	320.1	13.9	15.1	12.2
Chauffeurs	42.0	48.2	51.9	48.3	14.6	23.4	14.8
Delivery and route workers	825.7	917.1	991.4	901.6	11.1	20.1	9.2
Industrial truck operators	399.9	459.3	492.8	463.8	14.8	23.2	16.0
Log handling equipment operators	7.5	7.7	7.7	7.5	3.5	3.5	.3
Parking attendants	35.8	44.5	51.3	57.9	24.2	43.3	61.6
Railroad brake operators	74.1	66.7	73.4	67.6	-10.0	-.9	-8.7
Rental car delivery workers	9.4	12.1	12.4	11.9	29.1	32.3	26.8
Sailors and deckhands	33.8	34.6	35.7	30.9	2.1	5.5	-8.5
Streetcar operators	8.2	9.6	9.8	9.6	17.3	19.3	17.5
Taxi drivers	71.2	69.1	78.4	72.0	-3.0	10.0	1.0
Truck drivers	1,696.3	2,111.5	2,247.6	2,103.6	24.5	32.5	24.0
Transportation equipment operatives, n.e.c.	7.1	6.6	7.1	6.6	-6.3	-.2	-6.6
All other operatives	4,229.9	4,801.0	5,102.3	4,853.5	13.5	20.6	14.7
Batch plant operators	8.0	9.7	10.3	10.2	21.1	29.0	27.2
Blasters	9.1	11.6	12.9	12.0	28.3	42.5	32.7
Coil finishers	7.4	8.9	9.7	9.1	19.6	30.4	21.9
Cutters, machine	28.8	31.9	33.9	32.5	10.6	17.7	12.6
Cutters, portable machine	16.9	18.3	20.1	18.6	8.1	19.0	9.9
Cutter-finisher operators, rubber goods	7.4	9.3	9.4	9.4	26.0	26.8	27.2
Cutting machine operators, food	12.0	11.5	12.3	11.7	-4.0	2.3	-2.4
Die cutters and clicking machine operators	20.2	21.2	22.3	21.4	4.9	10.6	6.1
Dressmakers, except factory	46.0	48.9	53.1	50.5	6.4	15.4	9.8
Drillers, hand and machine	18.2	24.1	26.7	25.0	32.8	46.8	37.4
Dyers	13.4	15.0	15.9	14.9	12.2	18.3	10.9
Exterminators	25.6	33.7	37.4	35.2	31.6	46.2	37.5
Filers, grinders, buffers, and chippers	125.2	151.4	168.5	155.3	20.9	34.6	24.1

See footnotes at end of table.

Table C-1. Employment, 1980 and projected 1990 (three alternatives), and percent change, 1980-90 in occupations with 1980 employment of 5,000 or higher—Continued

(Thousands)

Occupation	Employment, all industries				Percent change		
	1980	1990 (Low)	1990 (High I)	1990 (High II)	1980-90 (Low)	1980-90 (High I)	1980-90 (High II)
Psychiatric aides	82.4	115.3	120.5	115.6	39.9	46.1	40.2
Selected personal service workers	1,660.3	1,979.0	2,153.4	2,057.9	19.2	29.7	23.9
Barbers	112.2	120.4	137.3	126.8	7.3	22.4	13.1
Baggage handlers and porters	5.8	5.1	5.6	5.2	-11.7	-4.2	-10.9
Bellhops, bag porters, and doorkeepers	26.6	28.5	31.7	28.7	7.2	19.2	7.9
Checkroom and locker room attendants	9.9	12.2	13.1	12.3	23.5	32.3	24.2
Child care attendants	41.0	55.4	59.6	59.1	35.3	45.3	44.2
Child care workers, except private household	455.3	580.3	613.9	598.8	27.4	34.8	31.5
Cosmetologists and women's hairstylists	466.1	529.0	600.9	564.5	13.5	28.9	21.1
Elevator operators	48.9	59.4	64.1	60.1	21.5	31.0	23.0
Flight attendants	55.9	64.1	68.0	64.5	14.6	21.6	15.4
Funeral attendants	10.4	10.6	12.7	11.7	1.8	22.9	13.0
Game and ride operators and concession workers	29.3	37.0	37.8	36.0	26.2	28.8	22.8
Guides, sightseeing and establishment	7.1	8.5	8.8	8.2	20.2	24.9	15.8
Housekeepers, hotel and motel	50.1	66.6	74.1	68.7	33.0	48.0	37.1
Manicurists	16.3	18.4	21.1	19.8	12.9	29.3	20.9
Masseurs and masseuses	6.2	6.8	8.1	7.5	9.2	30.9	20.9
Pin chasers	9.3	9.3	9.9	10.2	.5	6.4	10.2
Recreation facility attendants	68.9	82.9	85.3	82.5	20.3	23.7	19.7
Reducing instructors	27.7	28.9	35.0	32.3	4.4	26.4	16.5
Scalp treatment operators	9.7	12.2	14.1	13.1	26.6	45.6	35.8
School monitors	36.9	37.4	37.6	37.3	1.5	1.8	1.2
Shampooers	21.5	24.3	27.8	26.1	13.3	29.5	21.3
Ushers, lobby attendants, and ticket takers	41.4	46.3	45.9	45.7	11.9	11.0	10.4
Welfare service aides	94.5	126.4	131.5	129.8	33.8	39.2	37.4
Personal service workers, n.e.c.	9.4	8.6	9.6	9.0	-8.3	1.5	-4.8
Protective service workers	1,751.3	2,122.5	2,214.6	2,144.6	21.2	26.5	22.5
Bailiffs	8.3	9.7	9.8	9.7	17.1	19.1	17.3
Checkers, fitting room	8.9	11.3	11.8	11.7	27.1	33.0	32.1
Correction officials and jailers	103.4	151.6	154.2	151.8	46.5	49.1	46.8
Crossing or bridge tenders	29.3	32.3	33.0	32.3	10.4	12.9	10.5
Crossing guards, school	41.3	48.5	49.3	48.6	17.3	19.3	17.5
Firefighters	219.2	255.8	260.3	256.2	16.7	18.8	16.9
Fire inspectors	5.9	6.9	7.0	6.9	17.2	19.3	17.4
Fire officers	50.4	59.1	60.2	59.2	17.3	19.3	17.5
Fish and game wardens	6.5	7.3	7.4	7.3	13.0	14.9	13.1
Guards and doorkeepers	648.1	800.7	867.3	819.6	23.5	33.8	26.5
Lifeguards	19.5	25.0	26.2	24.4	28.1	34.3	25.4
Parking enforcement officers	7.4	8.7	8.8	8.7	17.3	19.3	17.5
Police detectives	63.3	72.2	73.5	72.3	14.0	16.1	14.2
Police officers	102.2	118.6	120.7	118.8	16.0	18.1	16.2
Police patrolmen/women	393.0	458.9	467.0	459.7	16.8	18.8	17.0
Sheriffs	22.2	26.1	26.5	26.1	17.3	19.3	17.5
Store detectives	18.3	26.1	27.4	27.1	42.8	49.7	48.1
Private household workers	988.4	980.7	992.5	987.0	-.8	.4	-.1
Child care workers, private household	393.7	411.2	416.2	413.8	4.4	5.7	5.1
Cooks, private household	23.2	18.5	18.7	18.6	-20.1	-19.2	-19.6
Housekeepers, private household	86.7	99.7	100.9	100.4	15.1	16.4	15.8
Laundresses, private household	6.4	2.2	2.3	2.3	-64.9	-63.5	-64.3
Maids and servants, private household	478.4	449.0	454.4	451.9	-6.1	-5.0	-5.5
Supervisors, nonworking, service	203.9	254.2	269.6	256.0	24.6	32.2	25.5
All other service workers	518.3	629.8	666.2	637.2	21.5	28.6	22.9
Laborers, except farm	5,859.8	6,668.2	7,144.6	6,790.5	13.8	21.9	15.9
Animal caretakers	94.4	112.5	121.8	123.9	19.3	29.1	31.3
Construction laborers, except carpenter helpers	101.6	122.2	133.1	124.9	20.2	30.9	22.9
Asphalt rakers	6.8	7.9	9.4	8.1	15.1	37.4	18.2
Fence erectors	6.9	8.8	9.3	9.0	27.3	34.2	30.5
Pipelayers	46.0	54.5	60.0	55.5	18.4	30.5	20.6
Reinforcing-iron workers	34.2	41.7	43.9	42.8	21.8	28.2	25.0
All other construction laborers	7.7	9.3	10.5	9.6	21.7	36.7	25.0
Cannery workers	75.6	79.5	84.2	88.8	5.2	11.4	17.5
Chain offbearers, lumber	22.0	23.9	23.9	22.7	8.5	8.5	3.2
Cleaners, vehicle	116.4	148.3	157.6	158.4	27.4	35.4	36.1
Conveyor operators and tenders	53.3	62.5	68.0	63.5	17.2	27.7	19.1
Forest conservation workers	13.7	14.7	15.1	14.8	7.8	10.1	8.2

See footnotes at end of table.

Table C-1. Employment, 1980 and projected 1990 (three alternatives), and percent change, 1980-90 in occupations with 1980 employment of 5,000 or higher—Continued

(Thousands)

Occupation	Employment, all industries				Percent change		
	1980	1990 (Low)	1990 (High I)	1990 (High II)	1980-90 (Low)	1980-90 (High I)	1980-90 (High II)
Floor sanding machine operators	12.3	10.9	12.2	11.4	-11.3	-1.2	-7.8
Fuel pump attendants and lubricators	401.3	475.1	491.9	481.4	18.4	22.6	19.9
Furnace operators and tenders, except metal	62.0	64.6	67.2	64.6	4.2	8.4	4.2
Kiln operators, minerals	7.4	7.6	7.9	7.5	2.6	7.7	1.2
Stationary boiler firers	48.4	50.5	52.5	50.7	4.4	8.5	4.7
All other furnace operators and tenders, except metal	6.2	6.5	6.7	6.5	4.8	8.3	4.1
Furniture assemblers and installers	8.8	10.8	11.5	10.8	21.9	30.8	22.6
Miscellaneous machine operatives:							
Meat and dairy	47.9	45.6	48.6	44.7	-4.8	1.3	-6.7
All other food	73.6	78.5	83.3	80.9	6.7	13.2	9.9
Tobacco	7.6	7.1	7.8	7.3	-5.8	3.8	-2.9
Lumber and furniture	47.5	58.9	60.0	55.6	23.8	26.2	17.0
Paper	106.5	117.8	120.3	118.9	10.5	13.0	11.6
Chemicals	153.4	166.6	175.9	172.2	8.6	14.6	12.3
Rubber and plastics	218.4	283.5	291.9	282.2	29.8	33.7	29.2
Leather	8.2	8.2	8.7	8.3	.1	5.8	1.5
Stone, clay, glass	47.1	53.2	55.9	53.7	12.9	18.8	14.0
Primary metals	85.6	100.2	105.8	100.5	17..	23.6	17.3
Manufacturing, n.e.c.	87.9	101.9	107.3	102.7	15.9	22.1	16.8
Nonmanufacturing, n.e.c.	40.0	42.9	45.6	42.2	7.2	14.2	5.5
Miscellaneous operatives, durable goods, n.e.c.	99.1	122.9	128.4	122.5	24.0	29.5	23.6
Miscellaneous operatives, nondurable goods, n.e.c.	250.8	257.2	275.6	258.7	2.6	9.9	3.2
Mixing operatives	51.5	51.3	54.9	51.9	-.3	6.5	.8
Nailing machine operators	9.4	11.0	10.9	10.9	16.7	15.7	15.7
Oilers	40.9	48.2	52.4	49.0	17.9	28.2	20.0
Photographic process workers	76.6	81.2	89.1	81.0	6.0	16.2	5.7
Power screwdriver operators	8.5	10.6	11.3	10.6	23.6	32.3	23.7
Punch and stamping press operators, except metal	5.3	6.5	6.8	6.4	23.4	29.2	21.4
Riveters	14.2	17.2	18.7	17.6	20.8	31.5	23.7
Rotary drill operators	22.6	24.2	25.5	24.0	7.2	13.0	6.3
Rotary drill operator helpers	39.7	42.3	44.6	42.0	6.6	12.4	5.7
Sandblasters and shotblasters	11.6	14.3	15.5	14.4	22.6	33.1	24.1
Sanders, wood	20.9	26.5	28.0	26.1	26.7	33.6	24.5
Shear and slitter operators, metal	31.2	37.0	40.5	37.8	18.6	29.9	21.2
Shoemaking machine operators	64.9	54.1	58.8	54.6	-16.5	-9.3	-15.8
Surveyor helpers	55.8	67.3	69.8	68.0	20.7	25.2	22.0
Termite treaters and helpers	8.8	11.6	12.9	12.1	32.6	47.7	38.7
Tire changers and repairers	60.7	70.9	76.8	73.0	16.8	26.4	20.2
Winding operatives, n.e.c.	49.6	58.0	62.1	59.0	17.0	25.2	19.0
Coil winders	31.0	36.8	40.4	37.6	18.8	30.2	21.3
Paper reel and rewinder operators	5.5	6.1	6.2	6.1	10.3	11.2	10.1
Winders, paper machine	5.7	6.3	6.3	6.3	10.6	11.1	10.4
All other winding operatives, n.e.c.	7.4	8.8	9.2	9.0	19.4	25.3	22.7
Wirers, electronic	30.7	35.1	38.4	36.2	14.4	25.1	17.7
Wood machinists	25.5	32.9	34.0	32.4	28.7	33.0	27.0
Operatives, n.e.c.	1,488.2	1,678.5	1,798.9	1,701.7	12.8	20.9	14.3
Service workers	15,547.1	19,103.4	20,233.6	19,374.1	22.9	30.1	24.6
Food service workers	6,183.5	7,771.0	8,189.2	7,824.6	25.7	32.4	26.5
Bakers, bread and pastry	48.1	56.6	59.3	57.0	17.6	23.2	18.3
Bartenders	382.2	452.8	479.6	457.3	18.5	25.5	19.6
Butchers and meat cutters	190.0	211.6	224.5	213.9	11.4	18.2	12.6
Cooks, except private households	1,122.5	1,365.1	1,436.5	1,377.8	21.6	28.0	22.7
Cooks, institutional	311.1	368.9	385.1	376.3	18.6	23.8	21.0
Cooks, restaurant	355.7	444.7	471.0	447.7	25.0	32.4	25.9
Cooks, short order and specialty fast foods	455.7	551.5	580.3	553.8	21.0	27.3	21.5
Food service workers, fast food restaurants	806.3	1,206.3	1,265.3	1,210.1	49.6	56.9	50.1
Hosts/hostesses, restaurants, lounges, and coffee shops	116.1	154.3	163.1	154.7	32.9	40.5	33.2
Kitchen helpers	839.4	1,070.7	1,130.4	1,082.6	27.6	34.7	29.0
Pantry, sandwich, and coffee makers	71.4	91.6	97.2	91.8	28.4	36.2	28.6
Waiters and waitresses	1,711.3	2,071.6	2,187.6	2,064.9	21.1	27.8	21.8
Waiters, assistants	280.3	362.6	384.0	365.9	29.4	37.0	30.5
All other food service workers	615.9	727.8	761.5	728.7	18.2	23.6	18.3
Janitors and sextons	2,751.2	3,252.5	3,499.9	3,312.8	18.2	27.2	20.4
Selected health service workers	1,490.2	2,113.8	2,248.2	2,154.0	41.8	50.9	44.5
Dental assistants	138.8	193.4	197.6	191.4	39.4	42.4	38.0
Health aides, except nursing	5.0	6.6	7.0	6.8	31.8	38.9	35.0
Medical assistants	89.4	116.3	122.8	115.7	30.1	37.3	29.5
Nurses aides and orderlies	1,174.6	1,682.3	1,800.3	1,724.5	43.2	53.3	46.8

See footnotes at end of table.

Table C-1. Employment, 1980 and projected 1990 (three alternatives), and percent change, 1980-90 in occupations with 1980 employment of 5,000 or higher—Continued

(Thousands)

Occupation	Employment, all industries				Percent change		
	1980	1990 (Low)	1990 (High I)	1990 (High II)	1980-90 (Low)	1980-90 (High I)	1980-90 (High II)
Furnace operators and heater helpers	8.3	9.8	10.3	9.8	18.0	23.5	17.8
Garbage collectors	117.3	136.5	147.5	136.5	16.4	25.8	16.4
Gardeners and groundskeepers, except farm	652.5	737.7	788.3	764.1	13.1	20.8	17.1
Helpers, trades	954.8	1,167.1	1,261.8	1,199.3	22.2	32.2	25.6
Line service attendants	30.3	31.8	33.9	32.0	4.7	11.6	5.5
Loaders, cars and trucks	6.2	7.6	7.4	7.2	21.5	17.8	15.1
Loaders, tank cars and trucks	8.8	9.6	10.3	10.3	10.2	17.9	17.8
Off-bearers	23.6	27.9	28.2	26.5	18.2	19.3	12.0
Riggers	28.3	33.1	35.3	33.8	16.9	24.6	19.5
Septic tank servicers	6.1	8.1	10.7	10.0	32.0	75.2	63.6
Setters and drawers	7.2	7.5	7.8	7.4	5.1	9.4	2.8
Shakeout workers, foundry	10.6	13.8	14.5	13.8	30.4	37.1	30.4
Stock handlers	965.0	1,127.4	1,206.5	1,133.1	16.8	25.0	17.4
Order fillers	363.7	405.9	443.3	404.3	11.6	21.9	11.2
Stock clerks, sales floor	601.3	721.5	763.2	728.9	20.0	26.9	21.2
Timbercutting and logging workers	74.6	59.1	62.7	60.8	-20.8	-16.0	-18.5
Choker setters, lumber	11.4	8.9	9.5	9.2	-22.0	-17.1	-19.5
Fallers and buckers	46.0	36.3	38.5	37.3	-21.2	-16.4	-19.0
All other timbercutting and logging workers	17.2	14.0	14.8	14.3	-18.6	-14.0	-16.6
Work distributors	17.7	20.8	22.9	21.4	17.7	29.6	20.7
All other laborers, except farm	2,471.4	2,706.6	2,892.7	2,727.4	9.5	17.0	10.4
Farmers and farm workers	2,689.2	2,193.1	2,426.3	2,327.4	-18.4	-9.8	-13.5
Farmers and farm managers	1,484.2	1,230.6	1,354.9	1,281.3	-17.1	-8.7	-13.7
Farmers (owners and tenants)	1,447.0	1,200.0	1,320.6	1,247.8	-17.1	-8.7	-13.8
Farm managers	37.2	30.6	34.3	33.6	-17.9	-7.8	-9.9
Farm supervisors and laborers	1,205.0	962.6	1,071.5	1,046.1	-20.1	-11.1	-13.2
Farm supervisors	30.0	24.8	27.8	27.4	-17.4	-7.4	-8.7
Farm laborers	1,175.0	937.8	1,043.7	1,018.7	-20.2	-11.2	-13.3

[1] As a result of differences in definition or data sources, the 1980 and projected 1990 employment data differ from those presented in chapter 4.

NOTE: n.e.c. = not elsewhere classified
SOURCE: National industry/occupation matrix

Table C-2. Occupations with 1980 employment of 4,000 - 4,999

OES matrix occupation	OES matrix occupation
Bag sewers	Instrument makers-A
Band scroll saw operators	Lease buyers
Boarding machine operators, hosiery	Loading machine operators
Boring machine operators, wood	Messengers, bank
Business brokers	Music directors
Camp directors	Nuclear engineers
Chippers	Panelboard and grinding mill panelboard operators
Clock and watch assemblers	Picture framers
Cloth feeders and back tenders	Planer operators
Coin machine operators and currency sorters	Printer-slotter feeders
Copy markers	Printer-slotter operators
Cutting and creasing press operators	Roll forming machine operators
Die setters	Rolling mill operator helpers
Dividing machine operators	Scrappers/strippers
Dredge operators	Shaper and router operators
EEG technicians	Shipwrights
Estimators, printing services	Signal maintainers
Film editors	Station agents
Folding machine operators	Television camera operators
Fourdrinier machine tenders	Tower operators
Garment repairers	Traffic technicians

Table C-3. Occupations with 1980 employment of 3,000 - 3,999

OES matrix occupation	OES matrix occupation
Automatic maintainers	Loom winder tenders
Automatic spring coiling machine operators	Lumber straighteners
Baggage handlers	Machine adjusters
Ballast cleaning-machine operators	Mattress makers
Blockmaking machine operators	Meat grinders
Blood bank technology specialists	Media analysts
Brattice builders	Media clerks, estimators, and billers
Burlers	Menders, cloth
Calender operators, rubber or plastics	Metal mold makers and repairers
Camera repairers	Mixers, stone, clay, and glass
Cap sewers	Novelty workers
Carton-forming machine operators	Opener tenders and waste machine tenders
Casters, ingots and pigs	Portfolio managers
Casters, pottery and porcelain	Power press tenders
Cigarette-making machine operators	Pulpers
Classified ad clerks, newspaper	Resawyers
Clean out drillers	Rigging slingers
Cloth printers	Rug cleaners, hand
Coater operators, off-machine	Service observers
Coil tapers, hand or machine	Shade ticket markers
Concrete mixer operators	Shell mold and core machine operators
Concrete pipe makers	Ship riggers
Concrete vault makers	Shoe parts sewers, hand
Core layers and sheet turners	Sign erectors
Corrugator operators	Slasher tenders
Cushion makers	Smash hands
Die sinkers	Sodabar operators
Draw-bench operators, tube drawers	Sound recording and reproduction technicians
Drier operators, chemicals, plastics, and rubber	Springers
Drillers, hand	Still operators, batch or continuous
Dye-range operators and spiral-dye-beck tenders	Taping machine operators
Dye-reel operators, jiggers, and pad-machine operators	Telegraph equipment maintainers
Dye-tub operators and random dyers	Tenter frame operators
Electric tool repairers	Tinters
Electromedical equipment repairers	Tipple operators
Floor workers, glass	Trimmers, plastic
Folding machine operators, paper	Tumbler operators
Fusing machine operators	Upholstery trimmers
Guides, travel	Vacuum plastic forming machine operators
Loader engineers	Veneer drier feeders
	Warp tying machine tenders

Table C-4. Occupations with 1980 employment of 2,000 - 2,999

OES matrix occupation	OES matrix occupation
Actuarial clerks	Harness placers
Appraisers	Heat sealers
Asphalt-plant operators	Hot plate plywood press operators
Atmospheric scientists	Impregnators, electronic
Automatic clippers, veneer	Insulation wrapping/braiding machine operators
Back tenders, cloth printing	Lathe operators, wood
Baggage porters	Making machine catchers
Beam-dyer operators and package-dyeing-machine operators	Margin clerks
Beater engineers	Museum curators
Beaters	Natural gas treating unit operators
Belt makers, apparel	Photolettering machine operators
Bias machine operators	Picker tenders
Blending machine operators	Pickers
Boatswains	Picklers, continuous pickling line
Bobbin winders, machine and sewing machine	Pipeliners
Bodymaker operators, tin can	Placers
Bootblacks	Pond workers, lumber
Box makers, paperboard	Pot tenders
Braiding machine operators	Private branch service advisors
Brick and tile making machine operators	Protective signal operators
Buffers, shoe parts	Punch press operators, plastics
Building inspectors, fire insurance	Purchase and sales clerks, security
Cake decorators	Quilling machine operators
Call-out operators	Railroad police
Cancellation clerks	Repairers, shoe finish
Candy makers	Right-of-way agents
Cheesemakers	Riveters, heavy
Cloth finishing range operators, chief	Rug cleaners, machine
Cloth finishing range tenders, middle	Scrap sorters
Cloth or carpet winders	Skivers
Cloth trimmers, machine	Sliver forming and winding operators
Coal washers	Smokers
Coating machine operators	Sorters, burned products
Convolute and spiral tube winders	Spotters, washable materials
Corrective therapists	Steel pourer helpers
Cutting machine operators	Stitchers, utility
Dispatchers, airplane	Stone setters
Drier operators, textiles and rugs	Tappers, metal
Encapsulators	Technical directors
Extrusion press operators, hot billets	Technical operators, oil and gas
Feed pellet mill operators	Telegraph plant maintainers
Filter/filter press operators	Teletype installers
Finishers, machine	Tenoner operators
Finishers, pottery and porcelain	Terrazzo workers
Flavor room workers, freezer operators	Timber cruisers
Flexo-folder-gluer operators	Trade recorders
Flexographic press operators	Traffic engineers
Forging and straightening roll operators	Treers
Form setters, metal road form	Turbine operators
Forming machine maintainers, glass	Veneer driers
Gas meter installers	Warp knitting machine operators
Gluing machine operators	Wire weavers
Gravure press operators	Wrapping machine operators

Table C-5. Occupations with 1980 employment of 1,000 - 1,999

OES matrix occupation
Adhesive bandage machine operators
Ampule fill, seal, wash operators
Assemblers for puller-over
Athletic trainers
Automatic assembly machine attendants
Band builders
Batch, furnace, and tank operators, glass
Bead flippers
Bevelers
Billposters
Blasters, construction
Bleach-range operators and knitting goods bleachers
Bleacher operators, pulp
Bottoming machine operators, etc.
Box estimators
Braiding machine tenders
Cage makers, hand or machine
Calender operators, cloth
Carbon black makers
Carbon setters
Card grinders
Carrier drivers
Casket coverers and liners
Casters
Casters, plastics
Catchers
Cementers, machine joiner
Cementers, oil well
Chemical waste treatment plant operators
Cigarette filter making machine operators
Coating mixer tenders
Colorists, textiles
Compounders
Compressors, tablet
Computers, prospecting; and computers, seismograph
Control panel operators, petroleum
Core feeders
Corrugator-knife operators
Crew schedulers
Curers, rubber goods
Custom tailors
Cut-off machine operators, tubing
Cut-off sawyers, log
Cylinder machine tenders
Dado operators
Decker operators
Die mounters
Die polishers, wire and tubes
Digester operator helpers
Digester operators
Dipping machine operators
Dividend clerks
Drapery hangers
Drawers-in, hand
Drawing-in machine tenders
Drier operators, coal and ore
Drycleaners, hand
Edge gluers
Electric meter installers
Electrolytic cell makers and repairers
Elevator installers and repairers
Fasteners, machine
Fermentation operators
Film bookers
Fine-graders
Fire bosses
Firers, marine
Freight handlers
Fumigators
Gang sawyers

OES matrix occupation
Gas dispatchers
Gasoline engine and mower repairers
Glass blowers
Glass cut-off machine operators
Glass grinders and watch crystal edge grinders
Glaziers, stained glass/joiners
Gunsmiths
Harness builders and loom changers
Head loaders
Headers, bottomers, and car droppers
Heating pit chargers
Histologic technologists
Hydraulic press operators, veneer
Ingredient scalers
Ink workers
Inkers, hand and machine
Installers, repairers, telephone
Instructors, leather/footwear machinery
Kettle operators, adhesive
Kiln operators, lumber
Kiln stack operators
Knitters, full fashioned garment
Laminating machine operators
Laminating machine operators, furniture
Layout markers, wood
Lehr tenders
Letterset press operators
Long-wall miner operator helpers
Loopers, hosiery
Luggage makers
Manifest clerks
Manipulators, table/bed operators
Marine service station attendants
Mathematical technicians
Mixer operators, hot metal
Mold makers, pottery
Mortuary beauticians
Mud plant operators
Multi-slide machine operators
Museum technicians, restorers
Napper tenders
Operators, door machine
Pattern cutters
Picklers, food
Pipe strippers
Plastic top installers
Pleating machine operators
Polishers, glass; and blockers
Polishers, mold
Power transformer repairers
Press operators, devulcanized scrap rubber
Proof press operators
Proofreaders, clerical
Prosthetists, orthotists
Pulling and lasting machine operators
Pumpers, meat
Raw cheese workers
Recovery operators, papermaking
Retort operators
Rig builders
Rock dust sprayers
Rock splitters, quarry
Roll builders
Rotation molding machine operators
Rubber covering machine operators
Sawyers, plastics
Sawyers, stone
Scorers
Screen cutters/markers, nonphotographic
Screen makers, photographic processing

Table C-5. Occupations with 1980 employment of 1,000 - 1,999—Continued

OES matrix occupation	OES matrix occupation
Second cutters, hand	Stone cutters, hand
Second loaders	Stone polishers
Securities cashiers, exchange	Stove tenders and blast furnace keepers
Security description clerks	Stretcher-leveler operators
Setters, molding and coremaking machines	Stunners
Shapers, hand	Sugar boilers
Shellfish processing machine tenders	Supercalender operators
Shooters; and shooters, seismograph	Tackers, togglers, and pasters
Shop repairers, instrument	Tally clerks, saw mill
Shuttlers, embroidery	Termite treater helpers
Side lasters	Tire finishers
Sinter press setters and operators	Tire repairers
Skin peeling machine operators	Transfer clerks
Slitter-creaser-slotter operators	Tube machine operators, bags
Slitter-scorer-cut-off operators	Tube molders, fiberglass
Slotter operators	Umpires
Sorter operators, green lumber	U.S. marshalls
Sorters, leather	Veneer lathe operators
Sorters, upholstery parts	Veneer repairers, hand
Speeder tenders	Veneer repairers, machine
Splicers	Vulcanizers, rubber plate
Sprayers, hand and machine	Watchcase vulcanizer tenders
Spring machine operators	Watershed tenders
Stapling machine operators	Waxing machine operators
Station engineers, main line	Wood carving machine operators
Steel die press operators	Wrapper layers
Stereotypers	Yarder engineers
Stewards, ship	
Stitchers, special machine	
Stone carvers, hand	

Table C-6. Occupations with 1980 employment under 1,000

OES matrix occupation
Abrasive grinders
Acetone recovery workers
Acidizers
Ager operators
Ager operators, cellulose
Air-drier machine tenders, paper
Airdox fitters
Anode rebuilders
Archivists
Art appraisers
Artificial appliance makers
Asbestos shingle shear machine operators
Asphalt blenders
Asphalt heater tenders
Asphalt mixing machine tenders
Asphalt-plant drier operators
Audiometrists
Auger machine operators
Autoclave operators
Automatic lump making machine operators
Automatic rubber hose vulcanizing machine operators
Bag builders
Baggers, plastics
Barley steepers, malt house operators
Bath makers
Batters-out
Bead forming machine operators
Beamers, hand
Beamers, machine
Bed lasters
Bed setters
Belt builders
Belt makers, sanding drums
Biochemistry technologists
Blanching machine operators
Blender conveyor operators
Board machine setters
Boat patchers, plastic
Boil-off machine operators, cloth
Bolters
Bolters, flour
Bottom fillers
Box cover strippers
Breakers
Brine makers
Brine tank tenders
Briquetting machine operators
Brown stock washers, blow pit operators
Buffers, hides or skins
Bulk plant operators, sugar
Bulk station operators
Bulk-systems operators, flour
Bull chain operators
Bullet processing machine operators
Bunch makers, machine
Burner tenders, perlite
Burnishers
Buttermakers
Calciner operators
Calciners, gypsum
Calender machine operators
Calendering machine operators, knit goods
Capital analysts
Carbon arc furnace operators
Carbon furnace operators
Carbonation equipment tenders, beer
Carbonation equipment tenders, sugar
Cartridge priming machine operators
Case makers
Casers

OES matrix occupation
Casing machine operators
Casters, finished or semi-finished products
Casters, plaster of paris
Casting room operators, cellophane
Centrifuge operators, food
Chain makers, hand
Channeling machine operators
Chasers, jewelry and silverware
Cheese blenders
Cheese casting machine operators
Chocolate temperers, confection
Chopped-strand operators
Cigar makers, hand
Claim agents
Clarifiers
Clay makers
Clay turners
Cloth shrinking machine operators
Coaches of professional athletes
Coater operators, insulation board
Coater operators, plastics
Coaters, pill
Coaters, roofing felt
Coating inspectors, pipelines
Cobblers
Concrete wall grinder operators
Concrete-stone finishers
Condenser setters
Conduit tubing machine operators
Contour grinders
Control operators, cryolite bath
Cooling machine operators
Core analysts
Corner cutters
Costumers
Counter clerks, telegraph office
Cracker and cookie machine operators
Cremators
Creping machine operators
Crude oil treaters
Cryolite recovery operators
Crystallizer operators
Cullet crusher/washer operators
Cupola chargers, insulation
Cupola operators, insulation
Cut-lace machine operators
Cutter and grinder operators
Decal appliers
Decorators, bakery products
Dehairing machine operators
Diamond cleaners and sawyers
Diamond experts
Diamond selectors
Dicer operators
Die holders
Diesel plant operators
Diffuser operators/battery operators, sugar
Dippers
Dispatchers, mine car
Dispatchers, refinery
Dispatchers, relay
Dope pourers, wrappers
Dowel machine operators
Drapers
Drapery and upholstery measurers
Drawing-kiln/glass rolling machine operators
Dredge dipper tenders
Dredge pipe installers
Dresser tenders
Drier and rewinder operators, rugbacking

Table C-6. Occupations with 1980 employment under 1,000—Continued

OES matrix occupation
Drier operators, insulation board
Drier tenders, metal scrap
Drill punch operators
Drillers, machine and drillers, multiple spindle
Drivers, assembly line
Droppers, fermenting cellar
Dry curers
Dry starch operators, automatic
Drying machine operators
Dust operators/ore crushing dust collectors
Dye tank tenders
Dynamite cartridge crimpers
Egg processors
Electric track switch maintainers
Electricians, office
Electrotypers
Ending machine operators
Enrobing machine operators/machine icers
Envelope finishing machine operators
Envelope folders, hand
Escorts and chaperons
Evaporator operators, chemical
Evaporator operators, papermaking
Extruder operators
Fashion coordinators
Feeders/catchers, tobacco
Fiberglass bonding machine tenders
Field mechanical meter testers
Filter cleaners
Firers, char-kiln
Firers, petroleum refining
Fireworks makers
Flaking roll operators, cereal
Flamers
Folders, machine
Folding machine feeders
Foreign reporters
Form makers
Form tamper operators
Formation fracturing operators
Formation testing operators
Four-corners-stayer machine operators
Fullers, textile
Fur cleaners
Fur cutters
Fur finishers
Fur glazing and polishing machine operators
Fur nailers
Furnace and burner tenders
Furnace combustion analysts
Furniture cleaners
Furriers
Gas pumping station operators
Gasket coater and drier operators
Gasket winders
Gatherers
Gem cutters
Glass blowing lathe operators
Glass calibrators
Glass cutters, machine
Glass finishers
Glazing machine operators
Glove turners and formers
Glue spreading machine operators, luggage
Gluemakers
Grain receivers
Graining press operators
Granulator machine operators
Greasemakers
Green anode processors
Guide setters
Gun perforator loaders
Hammersmiths, open die
Hand blockers, caps and hats
Hand edgers and belt seamers
Handbag framers
Harness makers
Hatters
Heaters, coke production
Heel attachers
Heel breasters, leather
Heel builders, hand and machine
Heel-seat fitters, machine
Heel-seat lasters, machine
Hi-density finishing operators, insulation board
Hide handlers
Hide pullers
High climbers
Hogshead coopers
Hose loaders
Hose makers
Hospital insurance representatives
Hydrator operators, lime
Hydraulic drillers
Hydrogenation operators
Icemakers
Incising machine operators
Instructors, bus and trolley
Instrument fitters
Instrument repairers, optical
Jewel-bearing lathe operators
Jigger operators
Joint cutters, machine
Kettle tenders, nonferrous metal
Kettle workers, soap
Kiln tenders, glass
Kiln transfer operators
Knife operators
Knotting machine operators/tag machine operators
Lace roller operators
Lamp keepers and repairers
Lasters, hand
Lasting machine operators
Lathe operators, grinding wheels
Leachers
Lead press operators
Lead stripping machine operators
Leaf conditioners, casers
Leather cleaners
Leather sprayers
Leather stampers, hand
Leather workers
Leather workers, surgical
Light technicians
Limers
Line walkers
Link-and-link hand knitting machine operators
Linter machine tenders
Liquefication–and regasification–plant operators
Loaders, malt house
Long-wall miner operators
Lump wrappers, hand
Mat machine operators
Measuring machine operators, leather
Melter operators, sugar
Mercerizer operators and mangle tenders
Metal mold makers
Meter readers, taxi
Microbiology technologists
Microphone boom operators

Table C-6. Occupations with 1980 employment under 1,000—Continued

OES matrix occupation
Mill hands, plate mill
Mill roll rewinders, cellophane
Millers, clay
Milliners
Mixers, ores and metals
Model and mold makers, plaster
Model makers, pottery
Mogul operators, confection
Mold cleaners, tire
Mold makers
Mold makers, brick, tile, and concrete
Mold pressers, hand
Molders, fiberglass luggage
Molders, machine (drugs)
Molders, pattern
Molders, shoe parts
Molding machine operators, pressers
Mortising machine operators
Motion picture narrators
Nail making, assembly machine operators
Needle-felt-making machine operators
Nickel plant operators
Nitro-cotton operators
Observers, electrical and/or gravity prospecting
Oil well wall samplers
Ordering machine operators
Orthopedic cast specialists
Orthopists
Outside property agents, shoppers
Painters, aircraft
Paintings restorers
Pan greasers, machine
Panel/patch/sealing machine operators
Paper cup machine operators
Paperhanger operators
Pattern gaters
Patternmakers, plastics
Patternmakers, stone
Perforator operators
Perforator operators, oil well
Pilling machine operators
Pipe wrapping machine operators
Planers, stone
Plastics repairers
Platform workers, glass
Plodder machine operators
Polishing-wheel makers
Pot liners
Potters, mash hand/plug shapers, machine
Powder cutting operators
Precipitator operators
Preparation room workers
Press operators, hardboard
Press operators, meat
Press operators, mica
Pressers, expeller operators
Process machine operators
Processors, solid propellant
Property handlers
Pullers-over
Pulp refiner operators
Pulverizer and drier tenders
Pump operators, by-products
Purification operators
Rackers, poolroom
Reagent operators
Recovery operators, catalysts
Refined syrup operators
Refiner operators, rubber

OES matrix occupation
Refinery operators
Refractory grinder operators
Refractory molders, hand
Rip and groove machine operators
Roasters, arc
Roasters, food
Roller builders, rubber
Roller machine operators
Rollers
Rolling machine operators
Roof cement and paint makers
Rope laying machine operators
Rotary kiln operators
Rough rounders, machine
Rubber grinder-finisher operators
Rubber mold makers
Ruling machine operators
Saddle makers
Sales agents and representatives, financial services
Salt washers
Salted meats conditioners
Sand blasters, stone
Sawyers, tail
Scouring train operators
Scouts
Script clerks
Seam rubbing machine operators
Seamless tube rollers
Seasoners, machine
Seasoning mixers
Security checkers
Separation tenders
Sewer tappers
Shactors
Shaker tenders
Shakers
Shank piece tackers
Sheeter operators, plastics
Shell machine operators
Shoe dyers
Shredder operators, cellulose
Singers, cloth
Sirup makers
Skein yarn dyers
Skimmers, reverberatory furnace
Slab depiler operators
Slime press and filter operators
Sole levelers, machine
Sorters, selectors, and graders, tobacco
Sorting machine operators
Special effects technicians
Spinners, confection
Spinners, jewelry and silverware
Splicers, rubber products
Splitters
Splitters, machine
Splitting machine feeders
Splitting machine tenders
Spout workers
Spray machine operators
Stainers
Stakers, machine
Staple cutters and/or staple processing machine operators
Staplers, mattress and bedspring
Stem roller or crusher operators
Stemmers, hand
Stemmers, machine
Stencil cutters
Stickers
Still operators
Still operators, asphalt

Table C-6. Occupations with 1980 employment under 1,000—Continued

OES matrix occupation	OES matrix occupation
Stitchdown thread lasters	Trench sewer shapers
Stock preparers	Tube winders, hand
Stone cutters, machine	Tumbler operators, plastics
Stone drillers	Twisters, hand
Story analysts	Ultrasonic machine operators
String machine operators/tape fasting operators	Vamp creasers
Striping machine operators, insulating wire	
Strippers	Varnish makers
Stripping machine operators	Veneer jointer operators
Stunt men or stunt women	Veneer sanders
	Video recording engineers
Tank house operators, copper	Vulcanizers, footwear
Tank tenders, silver refining	Wallpaper reelers and rolling machine operators
Tanning drum operators/colorers, hides	Ware finishers, footcasters, handlers
Tanning-liquor makers	Warm-in workers
Taxidermists	Wash screen operators, explosives
Thermolasting machine operators	Washers, synthetic fibers
Threaders, knit goods	
Threshers	Weather clerks
Tire bagging machine tenders	Wet machine tenders
Tire layers and extractors	Winders, roofing felt
	Wood grinder operators
Toe lasters	Wringer machine operators
Transfer controllers, saw mill	Yardage control operators, forming
Treaters	Yeast pushers
Treating engineers	

Appendix D. Detailed Training Statistics

This appendix presents information on one component of supply—structured training programs. It discusses the status of current education and training programs and provides the latest available data on enrollments and completions. Training programs discussed include:

- Public vocational education
- Private vocational education
- Employer training
- Apprenticeship programs
- Federal employment and training programs
- Armed Forces training
- Home study schools
- Community and junior colleges
- Colleges and universities

Tables D-1 through D-7 present detailed statistics on most of these training programs. The type of data presented and the time period covered vary by table. Table D-1 presents data on enrollments and completions in occupationally specific public vocational education programs during 1979-80. Table D-2 shows the number of enrollments, completions, and persons leaving with or without a marketable skill in private noncollegiate postsecondary vocational education programs during 1979-80. Table D-3 indicates the number of registrations, cancellations, and completions in apprenticeship programs during calendar year 1979. Table D-4 presents data on enlistments in the Armed Forces as of September 30, 1980. Table D-5 presents the number of associate degrees and other formal awards below the baccalaureate granted in academic year 1979-80. Tables D-6 and D-7 present data on bachelor's, master's, doctor's, and first professional degrees granted in academic year 1979-80.

Users who wish to relate training statistics to data on job openings should consult the *Vocational Preparation and Occupations* (VPO), developed by the National Occupational Information Coordinating Committee (NOICC). Education programs in the VPO are coded according to the *Classification of Instructional Programs* (CIPS),[1] developed by the National Center for Education Statistics (NCES). In academic year 1982-83, CIPS will replace the two NCES classification systems currently being used—the *Standard Terminology for Curriculum and Instruction in Local and State School Systems*, commonly referred to as Handbook VI, and *A Taxonomy of Instructional Programs in Higher Education*, commonly known as the HEGIS Taxonomy.

Data in this appendix should be used with caution because they represent only one component of supply and, in some cases, are incomplete and do not match a specific occupation. For a discussion of other sources of supply, see chapter 1.

[1] VPO includes only CIPS codes related to secondary and postsecondary vocational education. Baccalaureate and higher level programs are not included.

Public vocational education

Vocational education programs are conducted on three levels: Secondary; postsecondary; and adult, in which persons already in the labor force retrain or update and improve job skills. During the 1970's, the Federal Government provided categorical grants (targeted for specific purposes) to elementary and secondary schools to conduct vocational, technical, and continuing education programs. During the 1980's, Federal Government funding is likely to be in the form of block grants (for discretionary use) to the States to administer many of these programs. States in the past have strongly supported vocational education programs and are likely to continue this policy.

Types of training available. Vocational education includes programs in agriculture, distribution, health, home economics, and office, technical, and trade and industrial education. Other programs, such as consumer and homemaking training and industrial arts, do not generally lead directly to an occupational skill. Special vocational programs for the disadvantaged and handicapped also are provided.

Curriculums generally prepare trainees for specific occupations. Table D-1 provides data on enrollments and completions in occupationally specific public vocational education programs during 1979-80. These programs, which are offered at or above grade 11, are designed to impart entry level job skills.

Enrollments. Enrollments in public vocational education programs grew from 4.2 million in 1963 to 16.5 million in 1979-80, including over 2 million disadvan-

taged and 400,000 handicapped persons. The following tabulation, based on data from the NCES, shows the level and percent distribution of total enrollments by major program area.

Program area	Total enrollments	Percent distribution
Total	16,453,006	100
Office	3,400,057	21
Consumer and homemaking	3,385,736	21
Trade and industrial	3,215,987	20
Industrial arts	1,536,667	9
Distribution	961,018	6
Agriculture	878,529	5
Health	834,296	5
Occupational home economics	551,862	3
Technical	499,305	3
Other	1,189,549	7

Occupationally specific enrollments, which totaled nearly 6 million in 1979-80, accounted for 36 percent of all public vocational education enrollments. Approximately 33 percent of the occupationally specific enrollments were in office programs, and 30 percent were in trade and industrial programs (see table D-1).

Completions. Nearly 1.9 million persons completed occupationally specific public vocational education programs during 1979-80, including 234,000 disadvantaged and 45,000 handicapped persons. The distribution of completions by major program area is similar to the distribution of enrollments. About 60 percent of these completions were in office and trade and industrial programs, evenly divided between these two major areas (see table D-1).

Private vocational education

In 1980, the NCES surveyed about one-sixth of all private postsecondary vocational schools (7,432) and recorded 1,479,373 enrollments in 177 different programs. The following tabulation indicates the percent distribution of private postsecondary schools with occupational programs, by type of school:

	Percent
Cosmetology/barber	29
Business/commercial	19
Flight school	12
Trade school	10
Hospital school	9
College/university	5
Allied health	4
Arts/design	3
Junior/community college	3
Technical institute	2
Vocational/technical	1
Other	3

Of all private postsecondary schools with occupational programs, 83 percent were proprietary and were generally single-program schools; the remainder were nonprofit and were predominantly hospital schools and colleges and universities with occupational programs. In 1980, approximately 72 percent of all private postsecondary schools were accredited, State approved, or eligible for Federal student grant and loan programs.

While private postsecondary vocational schools outnumbered public postsecondary vocational schools by more than 3 1/2 to 1, the average enrollment in private schools—199 students—was only 43 percent of the average enrollment in public schools. Large schools typically offer a variety of programs in several vocational areas. Some business schools, for example, offer shorthand, typing, stenography, and fundamentals of accounting and computer operations, while many trade schools offer courses ranging from air-conditioning installation and repair to welding and cutting operations. On the other hand, small schools generally specialize in a single type of program, such as cosmetology or radiologic technology. Some programs—flight training, for example—require considerable individual attention and generally have low pupil/teacher ratios; less technically complex programs—real estate, for example—can accommodate large numbers of students.

Enrollments. Enrollments vary not only by program but also by major field. Private vocational education courses are classified into seven areas similar to those used for public vocational education programs: Agribusiness, marketing/distribution, health, home economics, business/office, technical, and trades and industry. In 1980, 37 percent of the 944,000 students enrolled in private noncollegiate postsecondary vocational schools were in trades/industry programs, 26 percent were in marketing/distribution programs, and 22 percent were in business/office programs (see table D-2).

Completions. In 1980, 580,000 students completed programs in private noncollegiate postsecondary vocational schools. Marketing/distribution programs had the largest proportion of completions (34 percent), followed by trades/industry programs (32 percent) and business/office programs (17 percent). Over 40,000 students did not complete their training but left with a marketable skill. Table D-2 provides data on enrollments, completions, and persons leaving with or without a marketable skill by detailed occupational program.

Employer training

Many companies in private industry have developed educational training programs to meet their needs. Generally, these programs serve three purposes: (1) To train new employees, (2) to improve the performance of employees in their present jobs, and (3) to prepare employees for new jobs and responsibilities.

Training varies among occupations. Skilled and semiskilled occupations have three on-the-job training paths—apprenticeship, structured on-the-job instruction, and learning by doing. Structured instruction may

range from scheduled training conducted by designated instructors to periodic training from supervisors and fellow employees. Unstructured training or learning by doing often involves simple directions on how to perform a routine task on a machine; further skills then are acquired through work experience or developed at the employee's initiative.

White-collar employees also may receive structured training. In many companies, structured training usually consists of "in-house" programs that offer courses during or after working hours. These courses normally are designed to meet specific company needs and often are offered by professional associations. In the banking industry, for example, the American Institute of Banking offers programs in 12 areas of banking, such as trusts, commercial lending, and bank marketing.

In addition, companies may allow employees to enroll in college or university courses. For example, under the tuition-aid program, employees may be partially or fully reimbursed for job-related courses taken after working hours. Occasionally, employees are permitted to take outside courses on company time or even to arrange for extended educational leaves of absence.

Limited data indicate that companies use education and training programs quite extensively. In a 1975 survey of firms with 500 or more employees, the Conference Board[2] found that of the 32 million employed, 4.3 million participated in "in-house" company programs, and 1.25 million were in tuition-aid programs. Although firms with fewer than 500 employees often do not have the resources to develop "in-house" programs, tuition-aid programs are not uncommon among these companies.

The lack of data on employer training hinders detailed analysis of occupational training and supply, however. BLS, with the support of the Employment and Training Administration (ETA), conducted a pilot survey in 1970 to test the feasibility of collecting data on occupational training in selected industries, and to determine the best method of collecting such data.[3] The results encouraged the Bureau, with further support from ETA, to conduct a nationwide, full-scale mail survey of employer training in nearly 5,000 establishments in 1975 and early 1976 on training provided in 1974. The resulting report, published in 1977, describes the characteristics of occupational training provided by employers in 14 selected occupations in four metalworking industries.[4]

1. Only 15 percent of all establishments in the four metalworking industries selected provided structured occupational training in the 14 occupations studied.
2. Establishments with 1,000 employees or more accounted for 44 percent of all enrollments in structured training.
3. About 71 percent of all structured training was conducted to qualify employees for work in an occupation; 29 percent was to improve current job skills.
4. More than two-thirds of all structured occupational training was provided on the job.
5. Establishments provided training primarily because they felt job skills could best be taught in their own training programs and because employees' education or training was inadequate.
6. Employee interest in an occupation was the primary factor used to select employees for training.

Apprenticeship programs

Training authorities generally recommend apprenticeship as the best way to acquire all-round proficiency in a craft. Most apprenticeships range from 3 to 5 years, depending upon the particular trade involved. These programs involve planned on-the-job training in conjunction with related classroom instruction—generally 144 hours each year. Mastery of a particular trade requires: (1) Learning the skills of the trade, (2) perfecting the use of each specific skill, and (3) bringing each skill up to the speed and accuracy required of the job.

Most apprenticeship programs have committees of employers and local trade unions that interview applicants, review the trainee's progress, and determine when an apprenticeship has been completed satisfactorily. Most programs are registered with Federal and State apprenticeship agencies, but sponsors are not required to register their programs. Some companies unilaterally plan, control, and tailor apprenticeship programs to their particular needs and, therefore, prefer not to register their programs with apprenticeship agencies. Unfortunately, no estimate is available of the number of apprentices in programs that are not registered.

The Department of Labor's Bureau of Apprenticeship and Training (BAT) registers, but does not finance, apprenticeship programs. BAT provides technical assistance and support to State apprenticeship agencies and to employers and unions in establishing and maintaining apprenticeship programs. Through 1979, BAT

[2] Seymour Lusterman, *Education in Industry*, Report 719 (New York, The Conference Board, Inc., 1977).

[3] "The BLS Pilot Survey of Training in Industry," *Monthly Labor Review*, February 1974, pp. 26-32.

[4] *Occupational Training in Selected Metalworking Industries: A Report on a Survey of Selected Occupations, 1974*, BLS Bulletin 1976/ETA R&D Monograph 53 (U.S. Department of Labor, Bureau of Labor Statistics and Employment and Training Administration, 1977).

[5] *Apprenticeship Registration Actions, by Region and State* (annual) through 1979 may be obtained from the Division of Reporting Operations, Employment and Training Administration, U.S. Department of Labor, Washington, D.C. 20210. In addition, the 1981 *Employment and Training Report of the President* contains a tabulation of the training status of registered apprentices through 1979.

maintained records of new registrations, completions, and cancellations of apprenticeships for each apprenticeable trade by State.[5] (Availability of these data in 1980 and beyond was uncertain as this publication went to press.)

The nearly 325,000 registered apprentices in training at the end of 1979 (see table D-3) represent the largest number in training since 1941 when these data were first recorded. Since 1941, nearly 1.2 million apprentices have completed training. In the last 10 years, however, about 475,000 apprentices have completed training—about two-fifths of the total since 1941. Annual fluctuations in the number of completions often reflect job market conditions.

Of the 43,454 registered apprenticeship completions in 1979, about 55 percent were in construction occupations, nearly 15 percent each in production occupations and mechanic and repairer occupations, and the remaining 16 percent in service, technologist and technician, transportation and material moving, and other miscellaneous occupations.

Although apprenticeship cancellations represent a potential loss of highly trained workers, many dropouts eventually become skilled craft workers through less structured means. In some instances, particularly when jobs are abundant, apprentices drop their training program in favor of earning a skilled worker's wage immediately. When the job market is depressed, however, they are more likely to complete their apprenticeships. In other instances, trainees who cancelled may have acquired enough experience to reenter the occupation at another time. Trainees sometimes are dropped involuntarily during extended periods of construction inactivity or high unemployment.

Federal employment and training programs

The Federal Government has conducted structured employment and training programs since the enactment of the Manpower Development and Training Act (MDTA) of 1962. With the passage of the Comprehensive Employment and Training Act (CETA) of 1973 and CETA amendments of 1978, programs were decentralized. Although the Federal Government has retained a few programs, such as the Work Incentive (WIN) Program, most Federal employment and training funds now are distributed to State and local governments, along with the responsibility for planning and managing these programs.

At the time this publication went to press, CETA was expected to be replaced with a job training program that would distribute block grants to States to provide job training to out-of-school 16- to 25-year-olds and to recipients of Aid to Families With Dependent Children. Training funds would focus on fields short of skilled workers, and would range from entry level positions to highly skilled jobs. Some funds would be specifically targeted for national programs—the Job Corps and programs for Indians, migrants, older workers, veterans, displaced workers, the handicapped, and others.

Comprehensive Employment and Training Act (CETA). Under CETA, all States, cities, and counties with populations of 100,000 or more receive Federal grants to run comprehensive employment and training programs in their localities. Some smaller units and rural areas also qualify for Federal allocations. Eligible units, called prime sponsors, receive funds to provide some of the services or to contract with others. The amount each prime sponsor receives is based upon its current population, unemployment rate, training needs, and number of economically disadvantaged persons. To receive Federal funds, every eligible sponsor—475 in fiscal year 1981— must submit a comprehensive plan describing its area, the services to be provided, and persons to be served.

Every State and area that operates a comprehensive employment development program must have a planning council whose members represent clients, labor, business, education, community organizations, the employment services, training agencies, and, where appropriate, agriculture. The councils help governments decide on the services needed and check on program operations.

In fiscal year 1981, CETA served about 2.4 million individuals, not counting nearly a million youth in subsidized summer jobs. About 44 percent received classroom training, 6 percent obtained on-the-job training, and 19 percent were provided work experience. The remainder received a variety of services designed to improve their employability.

Work Incentive (WIN) Program. The WIN Program helps employable recipients of Aid to Families with Dependent Children get and keep jobs. WIN, which is administered jointly by the Department of Labor and the Department of Health and Human Services through State employment services and welfare agencies, provides job development services and referrals and helps to provide employment, subsidizes employment, and provides limited training and supportive services, as needed.

After an interview to determine a person's job potential and needs, an employability plan is started to identify the services and activities needed to get a job. WIN tries to place people in unsubsidized jobs. Of the 1 million persons registered during fiscal year 1981, 319,000 were placed in unsubsidized jobs.

Job Corps. The Job Corps assists youth between 16 and 21 years of age, mostly school dropouts, who have poor educational records and who are "economically disadvantaged" to become employable and productive.

The program provides basic educational and vocational skills as well as social skills and counseling, medical, dental, and other support. The Job Corps differs from other Federal employment programs in that centers provide residential living 24 hours a day, 7 days a week. Centers vary in enrollment from 170 to 2,600 and serve men, women, or both; they may be urban or rural.

Fields in which training was offered in fiscal year 1981 included clerical-sales, services, forestry-farming, food service, auto and machine repair, construction, electrical appliance repair, industrial production, transportation, and health occupations. Of the 114,000 students enrolled, approximately 72,000 had left the program by year-end, of whom about 44,600 were reported as completing the training. About 27,400 students left before completing their training, which generally lasts from 9 months to 2 years.

About 26,600 of those completing their training were reported to be available for placement. About 17,000 (64 percent) of those available obtained job placements, with 6,900 being placed in their chosen field. Most of the remainder of those completing training—about 18,000—received school or military placement.

Armed Forces training

The Armed Forces provide training in hundreds of specialized occupational skills. Each year, thousands of military recruits complete extensive training in computer repair, medical care, food service, metalworking, and many other fields. When these persons leave the military, they often possess skills that qualify them for specialized civilian occupations.

However, some military skills are not directly comparable to those needed in civilian jobs or are specific only to the needs of the Armed Forces. Most of these persons will need additional training after they leave the service to qualify for civilian jobs that are similar to their military jobs. For example, a navigation/bombing training and flight simulator specialist has many, but not all, of the skills needed to become an electronic technician. A few military skills, such as those learned by infantry specialists, are unique to the military and have limited application to civilian jobs.

In an effort to assist military personnel in utilizing their training to qualify for civilian jobs, the Army, Navy, and Marine Corps, in concert with the Bureau of Apprenticeship and Training, have established registered apprenticeship programs for uniformed personnel. Only occupations that are comparable or identical to civilian occupations are registered. Individuals participating in a program record their hours of training and work assignments in a logbook that documents their service experience and which can be presented to an employer, labor union, or joint apprenticeship committee when they apply for a job.

The largest proportion of Armed Forces enlistees train in the mechanical and technical areas. The following tabulation shows the number of enlisted personnel in each of the nine major occupational groups as of September 30, 1980:

Infantry, guncrews, and seamanship specialists	242,389
Electronic equipment repairers	154,559
Communications and intelligence specialists	145,012
Medical and dental specialists	77,604
Other technical and allied specialists	37,723
Functional support and administration	269,849
Electrical and mechanical equipment repairers	348,461
Craft workers	70,636
Service and supply handlers	156,228

Table D-4 provides more detail on these occupational groups.

To aid in "translating" military job titles, the Department of Defense has compiled a military-civilian job comparability manual. The *Military-Civilian Occupational Source Book* relates military jobs by service branch to their civilian counterparts as identified in the Department of Labor's *Dictionary of Occupational Titles*. Although intended for use by high school guidance counselors, the manual can also serve as a useful tool for employees and vocational counselors involved in job placement for veterans.

Home study schools

Home study (correspondence) schools provide many individuals with an alternative means of education and training. Since many people are unable to attend school for one reason or another, taking a training program through home study is their only alternative for gaining a skill. Courses offered through home study programs vary in length, skill level, and degree of specialization, and emphasize vocational, academic, or simply personal enrichment.

In 1980, about 2.5 million persons were enrolled in home study courses, according to the National Home Study Council (NHSC). Enrollment in Federal Government and military programs totaled 1.5 million; 1.1 million students took courses offered by the 77 schools accredited by the NHSC; most of the remaining home study students were enrolled in programs offered by religious organizations and colleges and universities.

Correspondence schools generally require students to complete a certain number of lessons within a specified length of time to obtain a certificate of completion. Correspondence school students have a completion rate of about 55 percent.

Since 1976, the NCES has collected data on one source of home study—private noncollegiate postsecondary correspondence schools. Data appear in *Enrollments and Programs in Noncollegiate Postsecondary Schools*.

Based on the information available, home study schools should remain a significant source of training for many men and women because it is a convenient and relatively low-cost method of obtaining new knowledge or skills.

Community and junior colleges

Community and junior colleges play an integral part in the American educational system. By offering a wide variety of courses and programs, these schools enable many students from diverse backgrounds to obtain occupational and educational training beyond high school. For students interested in transferring to a 4-year college, many programs are designed to provide a general educational background in arts and sciences. Students who wish to specialize in a particular field may enroll in vocational or occupational curriculums, such as dental hygiene or data processing. Typically, programs in junior and community colleges last 2 years and result in an associate degree. Some programs last less than 2 years and students are granted certificates or other awards upon completion.

According to the NCES, enrollments in 2-year institutions of higher education doubled over the 1970-80 period—from 2,223,000 to 4,526,000. NCES projects that enrollments in 2-year institutions will increase steadily through the 1980's—to 5,000,000 by 1990.

During the 1970-80 period, awards of associate degrees increased by 60 percent, according to recent surveys.[6] A shift in student attitudes, placing more value on job training, was apparently a factor in the upsurge in associate degrees awarded. Associate degrees in occupational curriculums grew by 134 percent over the 1970-80 period, while degrees in the arts and sciences increased by only 5 percent. In academic year 1979-80, 63 percent of all associate degrees were awarded in occupational curriculums, while 37 percent were awarded in arts and sciences and general programs. Table D-5 provides detailed data on associate degrees and other formal awards below the baccalaureate granted during academic year 1979-80.

Because community and junior colleges can quickly adjust their programs to meet new employment situations and student interests, radical changes in enrollments in particular curriculums can and do take place in a short period of time. For this reason, NCES does not project the number of enrollments in specific curriculums. Some information on future enrollments may be obtained from State and local community and junior college administrators.

[6]The Higher Education General Information Survey (HEGIS) of NCES provides annual data on associate degrees and other awards below the baccalaureate, including those granted by 4-year colleges. In 1979-80, 2-year institutions awarded 86 percent of these degrees.

Colleges and universities

Colleges and universities serve many purposes, including providing individuals with specific occupational training. A college education provides the necessary background to enter fields such as engineering, law, business, the humanities, and the natural sciences.

The length of a college education depends on the student's interests and career goals. Most students seek employment after obtaining a bachelor's degree, which usually requires 4 years. Those who wish to qualify for positions requiring more specialized knowledge often continue their study. Master's, doctorate, and professional degree programs require several additional years of study after the bachelor's degree. Occasionally, these programs accept exceptional students after 2 or 3 years of undergraduate work.

College and university enrollments increased steadily during the 1960's and early 1970's—from 4,748,000 in 1965 to 7,215,000 in 1975. The rate of increase slowed during the late 1970's—to 7,571,000 by 1980. The NCES projects that enrollments will level off in the early 1980's—to 7,789,000 in 1982—then decline slowly during the late 1980's to 7,101,000 by 1990.

The number of degrees conferred by colleges and universities is closely related to enrollments. During academic year 1979-80, 1,330,000 persons earned degrees—929,000 bachelor's degrees, 298,000 master's degrees, 33,000 doctoral degrees, and 70,000 first professional degrees. NCES projects that the total number of degrees will increase to 1,405,000 in academic year 1984-85, then drop off to 1,339,000 by academic year 1989-90.[7]

Tables D-6 and D-7 show the number of degrees conferred by major field of study. Of course, many graduates do not pursue careers in their field of study, but studies have shown that the proportion of graduates of occupational curriculums who directly enter related occupations tends to be very high, particularly if training takes a number of years. For example, nearly all medical school graduates enter medicine and most engineering school graduates enter engineering. However, for many liberal arts graduates, whose training is less occupationally oriented, entry rates into occupations related to a college major are substantially lower. This is especially true at the bachelor's degree level since many graduates enter professional school, teaching, or occupations for which a college degree in any one of a number of fields may be adequate preparation.

A recent survey by NCES collected data on the labor force status in February 1978 of people who received bachelor's degrees between July 1976 and June

[7]Projections, along with a discussion of the projection methodology, are published by NCES in *Projections of Education Statistics to 1990-91*.

1977.[1] The Bureau of Labor Statistics also has analyzed these data for all graduates and for each of 19 major fields of study. Information on the labor force, occupational, and graduate school status of each of these groups is presented in an article, "College Majors and Jobs," in the Summer 1982 issue of the *Occupational Outlook Quarterly*. Additional followup studies of college students and graduates are available from surveys conducted by college placement offices, professional societies, and other organizations. Most of these data are limited to graduates from a single institution or field.

[1] The results of the survey are published by NCES in *New Teachers in the Job Market* and *Occupations of Recent College Graduates*.

Table D–1. Enrollments and completions in occupationally specific[1] public vocational education programs, 1979–80

DOE Instructional code	Title	Enrollments	Completions
	Total	5,979,508	1,857,934
01.	Agriculture, total	384,940	140,483
01.0100	Agricultural production	173,052	64,483
01.0200	Agricultural supplies/services	21,517	8,196
01.0300	Agricultural mechanics	66,727	25,716
01.0400	Agricultural products	4,922	2,006
01.0500	Horticulture	71,358	22,601
01.0600	Renewable natural resources	14,331	4,263
01.0700	Forestry	11,213	3,551
01.9900	Other agriculture	21,820	9,667
04.	Distribution, total	601,275	228,976
04.0100	Advertising services	12,977	3,681
04.0200	Apparel and accessories	22,515	9,680
04.0300	Automotive	5,454	2,746
04.0400	Finance and credit	36,364	6,448
04.0500	Floristry	4,959	2,251
04.0600	Food distribution	22,769	12,594
04.0700	Food services	31,462	16,227
04.0800	General merchandise	186,107	72,446
04.0900	Hardware, building materials	2,876	1,676
04.1000	Home furnishings	2,565	950
04.1100	Hotel and lodging	14,067	2,764
04.1200	Industrial marketing	18,062	4,812
04.1300	Insurance	5,840	1,768
04.1500	Personal services	4,596	2,230
04.1700	Real estate	106,616	39,578
04.1800	Recreation and tourism	16,064	4,482
04.1900	Transportation	14,113	4,713
04.2000	Retail trade, other	13,612	6,209
04.9900	Other distributive education	80,257	33,721
07.	Health, total	455,129	147,881
07.0101	Dental assisting	16,371	6,986
07.0102	Dental hygiene (associate)	7,433	2,085
07.0103	Dental laboratory technology	5,105	1,505
07.0203	Medical laboratory assisting	13,271	2,479
07.0299	Other medical laboratory technology	4,831	1,187
07.0301	Nursing, associate degree	104,753	24,523
07.0302	Practical (vocational) nursing	73,968	29,660
07.0303	Nursing assistance (aide)	49,572	24,850
07.0399	Other nursing	16,760	6,512
07.0400	Rehabilitation	7,956	1,695
07.0501	Radiologic technology (X-ray)	10,705	2,653
07.0800	Mental health technology	10,324	1,835
07.0903	Inhalation therapy technology	10,096	2,948
07.0904	Medical assisting	20,218	5,816
07.0906	Community health aide	7,866	3,605
07.0907	Medical emergency technician	20,916	6,706
07.9900	Other health education	74,984	22,836
09.02	Occupational preparation, total	242,087	90,935
09.0201	Care and guidance of children	93,795	30,478
09.0202	Clothing management, production, and services	27,753	9,853
09.0203	Food management, production, and services	76,726	30,550
09.0204	Home furnishing, equipment, and services	9,313	2,249
09.0205	Institutional and home management and services	5,356	2,330
09.0299	Other occupational preparation for homemaking	29,144	15,475
14.	Office occupations, total	1,970,518	563,312
14.0100	Accounting and computing occupations	414,543	107,409
14.0201	Computer and console operators	40,771	12,209
14.0203	Programmers	76,616	15,402
14.0299	Other business data processing	95,134	18,917
14.0300	Filing, office machines, clerical occupations	409,517	122,758
14.0400	Information, communication occupations	38,673	13,016
14.0500	Materials support, transportation, etc.	3,547	1,016
14.0600	Personnel, training, and related occupations	22,702	4,341
14.0700	Stenography, secretarial, and related occupations	421,029	125,731
14.0800	Supervisory and administrative management occupations	182,217	24,771
14.0900	Typing and related occupations	200,622	85,169
14.9900	Other office occupations	65,147	32,573

See footnotes at end of table.

Table D-1. Enrollments and completions in occupationally specific[1] public vocational education programs, 1979-80—Continued

DOE instructional code	Title	Enrollments	Completions
16.	Technical, total	387,117	82,573
16.0103	Architectural technology	27,441	5,185
16.0104	Automotive technology	11,952	3,570
16.0106	Civil technology	16,605	2,661
16.0107	Electrical technology	14,719	2,120
16.0108	Electronic technology	87,695	17,447
16.0110	Environmental control technology	8,064	1,170
16.0111	Industrial technology	14,561	2,237
16.0113	Mechanical technology	25,419	4,590
16.0117	Scientific data technology	18,575	3,437
16.0601	Commercial pilot training	7,198	1,856
16.0602	Fire and safety technology	13,654	4,520
16.0605	Police science	55,843	15,707
16.9902	Water and wastewater technology	2,989	683
16.9900	Other technical education	82,402	17,390
17.	Trade and industrial, total	1,792,052	562,952
17.0100	Air-conditioning	48,799	12,508
17.0200	Appliance repair	11,130	3,167
17.0301	Body and fender repair	66,074	20,152
17.0302	Auto mechanic	237,557	80,266
17.0399	Automotive specialization	20,294	8,560
17.0400	Aviation occupations	24,425	5,791
17.0700	Commercial art occupations	50,025	10,262
17.0900	Commercial photographic occupations	24,184	6,612
17.1001	Carpentry, construction	106,551	34,325
17.1002	Electricity, construction	28,625	8,755
17.1004	Masonry	27,593	8,984
17,1007	Plumbing and pipefitting	16,304	4,978
17.1099	Other construction and maintenance trades	69,901	24,744
17.1100	Custodial services	9,545	3,029
17.1200	Diesel mechanic	24,518	6,927
17.1300	Drafting occupations	103,560	30,370
17.1400	Electrical occupations	49,690	9,519
17.1500	Electronic occupations	93,835	28,096
17.1700	Supervisor and management development	21,036	6,078
17.1900	Graphic arts occupations	69,210	23,592
17.2100	Instrument maintenance and repair occupations	3,541	778
17.2200	Maritime occupations	6,402	1,132
17.2302	Machine shop occupations	74,435	21,570
17.2303	Machine tool operations	8,617	2,610
17.2305	Sheet metal	11,903	3,454
17.2306	Welding and cutting	125,675	37,279
17.2307	Tool and die making	4,299	1,067
17.2399	Other metalworking occupations	29,621	12,514
17.2400	Metallurgy occupations	607	240
17.2602	Cosmetology	77,673	25,427
17.2699	Other personal services	9,249	3,601
17.2700	Plastics occupations	2,498	1,057
17.2801	Firefighter training	25,495	13,800
17.2802	Law enforcement training	57,914	15,588
17.2899	Other public services	24,462	4,899
17.2900	Quantity food occupations	34,979	11,092
17.3000	Refrigeration	3,742	1,155
17.3100	Small engine repair	21,434	7,490
17.3200	Stationary energy sources occupations	2,213	740
17.3300	Textile production and fabrication	18,579	5,845
17.3500	Upholstering	8,400	2,560
17.3600	Woodworking occupations	28,091	9,821
17.9900	Other trade and industrial occupations	109,367	42,518
	Other programs, greater than 1 percent of total[2]	85,486	25,301
	Other programs, less than 1 percent of total[3]	60,904	15,521

[1] Occupationally specific enrollments include students above grade 10 enrolled in programs which are designed to train individuals for specific occupations. Excluded are all programs in industrial arts and consumer and homemaking training, as well as prevocational, counseling and guidance, and cluster programs (those programs that include 4 or more subjects that cannot be separated and identified as a complete program).

[2] Includes those programs that are more than 1 percent of a program area (e.g., Agriculture) that are not listed separately.

[3] Includes those programs that are less than 1 percent of a program area that are not listed separately.

SOURCE: U.S. Department of Education, National Center for Education Statistics.

Table D-2. Total enrollments, total completions, total who left with or without a marketable skill, and total still enrolled, by individual programs for private noncollegiate postsecondary schools with occupational programs: 1979-80[1]

DOE instructional code and title	Total enrollments	Completions	Left with marketable skill	Left without marketable skill	Still enrolled
Total, all programs	944,145	579,748	40,699	131,842	191,793
01. Agribusiness, total	3,929	3,436	80	242	170
01.0100 Agricultural production	235	235	0	0	0
01.0200 Agricultural supplies/services	0	0	0	0	0
01.0299 Veterinarian assistant	1,070	803	49	174	43
01.0300 Agricultural mechanics	0	0	0	0	0
01.0400 Agricultural products	0	0	0	0	0
01.0500 Ornamental horticulture	2,624	2,398	31	68	127
01.0600 Agricultural resources	0	0	0	0	0
01.0700 Forestry	0	0	0	0	0
01.9900 Other	0	0	0	0	0
04. Marketing and distribution, total	230,281	198,379	1,569	20,744	9,589
04.0100 Advertising services	0	0	0	0	0
04.0200 Apparel and accessories	11,633	6,563	258	1,878	2,925
04.0300 Automotive sales	35	35	0	0	0
04.0400 Finance and credit	29,296	26,505	19	2,697	75
04.0500 Floristry	0	0	0	0	0
04.0600 Food distribution	781	577	127	77	0
04.0700 Food service technology	80	40	5	3	32
04.0800 General merchandise	443	62	15	133	232
04.0900 Hardware, building materials	0	0	0	0	0
04.1000 Home furnishings management	0	0	0	0	0
04.1100 Hotel and lodging	420	336	49	0	35
04.1200 Industrial marketing	0	0	0	0	0
04.1300 Insurance	13,386	11,714	0	0	1,672
04.1400 International trade	0	0	0	0	0
04.1500 Personal service sales	588	573	14	1	0
04.1600 Petroleum sales	0	0	0	0	0
04.1700 Real estate	145,788	129,954	176	12,867	2,789
04.1800 Recreation and tourism	15,256	12,769	292	1,396	789
04.1900 Transportation services	455	121	15	6	312
04.2000 Retail trade, other	1,463	621	153	110	579
04.3100 Wholesale trade, other	0	0	0	0	0
04.9900 Other	10,658	8,509	435	1,576	139
07. Health occupations, total	87,099	45,130	2,856	10,132	28,987
07.0101 Dental assistant	6,128	4,420	165	660	883
07.0102 Dental hygiene (associate)	0	0	0	0	0
07.0103 Dental laboratory technology	2,687	1,601	140	310	637
07.0199 Other dental	117	65	3	14	35
07.0201 Cytology	0	0	0	0	0
07.0202 Histology	4	2	0	0	1
07.0203 Medical laboratory assisting	766	581	16	124	45
07.0204 Hematology	329	172	11	38	108
07.0299 Medical laboratory technology, other	3,143	1,890	26	585	644
07.0301 Nursing (associate degree)	1,863	969	61	217	616
07.0302 Practical (vocational) nursing	5,848	3,674	814	388	973
07.0303 Nursing assistant (aide)	6,458	4,733	148	1,214	364
07.0304 Psychiatric aide	86	63	16	8	0
07.0305 Surgical technician	381	163	28	35	153
07.0399 Nursing, other	26,534	7,242	130	2,842	16,320
07.0401 Occupational therapy	0	0	0	0	0
07.0402 Physical therapy	0	0	0	0	0
07.0499 Rehabilitation services, other	0	0	0	0	0
07.0501 X-ray technician	5,844	1,771	0	471	3,603
07.0502 Radiation therapy	249	208	10	10	21
07.0503 Nuclear medical technology	41	21	1	5	14
07.0599 Radiologic, other	351	299	42	11	0
07.0600 Optical technology	0	0	0	0	0
07.0700 Environmental health technology	0	0	0	0	0
07.0800 Mental health technology	0	0	0	0	0
07.0901 Electroencephalograph technology	402	363	0	39	0
07.0902 Electrocardiograph technology	1,110	852	0	259	0
07.0903 Respiratory therapy technology	1,421	682	11	183	546
07.0904 Medical assisting (office)	19,416	12,775	1,128	2,260	3,256
07.0906 Community health aide	0	0	0	0	0
07.0907 Medical emergency technician	249	65	21	78	84

See footnotes at end of table.

Table D-2. Total enrollments, total completions, total who left with or without a marketable skill, and total still enrolled, by individual programs for private noncollegiate postsecondary schools with occupational programs: 1979-80[1]—Continued

DOE instructional code and title	Total enrollments	Completions	Left with marketable skill	Left without marketable skill	Still enrolled
07.0909 Mortuary science	2,185	1,709	0	113	362
07.0915 Medical records technician	402	354	0	46	2
07.0920 Physician's assistant	162	83	5	19	54
07.9900 Health occupations, other	925	374	80	203	268
09. Home economics, total	0	0	0	0	0
09.0201 Child care	0	0	0	0	0
09.0202 Clothing management, production, and services	0	0	0	0	0
09.0203 Food management, production, and services	0	0	0	0	0
09.0204 Home furnishings	0	0	0	0	0
09.0205 Institutional/home management	0	0	0	0	0
09.0299 Home economics, other	0	0	0	0	0
14. Business and office, total	196,195	98,021	18,121	32,218	49,826
14.0100 Accounting	20,783	10,858	1,798	3,583	4,543
14.0201 Computer operator	1,692	1,203	35	228	225
14.0202 Keypunch operator	19,913	11,965	570	3,576	3,803
14.0203 Computer programmer	27,452	11,569	1,292	6,100	8,489
14.0204 Systems analyst	0	0	0	0	0
14.0299 Business data processing	1,063	398	44	228	392
14.0300 General office	2,970	1,621	204	395	749
14.0400 Information, communication occupations	4,300	2,333	455	743	768
14.0500 Materials support occupations	0	0	0	0	0
14.0600 Personnel occupations	0	0	0	0	0
14.0700 Stenographic, secretarial, and related occupations	94,244	43,991	11,226	13,419	25,607
14.0800 Supervisory and administrative management occupations	13,673	6,599	1,396	1,607	4,069
14.0900 Typing and related occupations	11,220	6,951	1,101	2,248	921
14.9900 Office occupations, other	885	533	0	91	261
16. Technical occupations, total	44,378	22,180	2,208	7,006	12,980
16.0101 Aeronautical technology	2,395	767	67	492	1,069
16.0102 Agricultural technology	0	0	0	0	0
16.0103 Architectural technology	412	167	0	91	155
16.0104 Automotive technology	1,318	658	248	412	0
16.0105 Chemical technology	0	0	0	0	0
16.0106 Civil technology	226	142	20	16	47
16.0107 Electrical technology	2,377	667	116	281	1,312
16.0108 Electronic technology	18,637	7,533	993	3,185	6,926
16.0109 Electromechanical technology	124	45	1	21	57
16.0110 Environmental control technology	201	73	0	30	96
16.0111 Industrial technology	135	50	0	5	81
16.0112 Instrumentation technology	287	236	26	22	0
16.0113 Mechanical technology	1,256	921	0	139	196
16.0114 Metallurgical technology	0	0	0	0	0
16.0115 Nuclear technology	0	0	0	0	0
16.0116 Petroleum technology	0	0	0	0	0
16.0117 Scientific data processing	1,507	488	43	191	786
16.0203 Legal assistant	788	706	12	42	27
16.0601 Commercial pilot training	0	0	0	0	0
16.0602 Fire and fire safety technology	0	0	0	0	0
16.0603 Forestry technology	0	0	0	0	0
16.0604 Oceanographic technology	0	0	0	0	0
16.0605 Police science technology	0	0	0	0	0
16.0606 Teacher's assistant	0	0	0	0	0
16.0607 Library assistant	0	0	0	0	0
16.0608 Broadcast technician	9,924	6,736	583	1,716	890
16.0695 Performing artists	4,369	2,705	85	321	1,259
16.0699 Technology, other	163	163	0	0	0
16.9901 Air pollution technology	0	0	0	0	0
16.9902 Water and waste water treatment technology	259	121	13	42	80
17. Trade and industrial, total	334,828	184,749	13,906	55,155	81,011
17.0100 Air conditioning installation and repair	8,684	4,918	610	1,936	1,220
17.0200 Appliance repair	27	16	0	3	8
17.0301 Body and fender repair	2,333	1,407	148	424	352
17.0302 Auto mechanic	13,863	6,444	1,779	2,136	3,506
17.0303 Auto specialization, repair	472	446	21	5	2

See footnotes at end of table.

Table D-2. Total enrollments, total completions, total who left with or without a marketable skill, and total still enrolled, by individual programs for private noncollegiate postsecondary schools with occupational programs: 1979-80[1]—Continued

DOE instructional code and title	Total enrollments	Completions	Left with marketable skill	Left without marketable skill	Still enrolled
17.0399 Automotive services, other	424	285	45	85	8
17.0401 Aircraft maintenance	0	0	0	0	0
17.0402 Aircraft operations	0	0	0	0	0
17.0403 Ground operations	0	0	0	0	0
17.0500 Blueprint reading	0	0	0	0	0
17.0600 Business machine maintenance	519	520	0	0	0
17.0700 Commercial art occupations	23,752	5,188	777	6,197	11,590
17.0800 Commercial fishery occupations	0	0	0	0	0
17.0900 Commercial photography occupations	7,840	1,234	339	2,093	4,174
17.1001 Carpentry, construction	629	417	26	104	82
17.1002 Electricity, construction	0	0	0	0	0
17.1003 Heavy equipment maintenance operations	3,138	2,075	18	225	821
17.1004 Masonry	407	257	34	44	69
17.1005 Painting and decorating	92	54	5	14	19
17.1006 Plastering	0	0	0	0	0
17.1007 Plumbing and pipefitting	171	101	21	9	35
17.1008 Drywall installation	0	0	0	0	0
17.1009 Glazing	0	0	0	0	0
17.1010 Roofing	0	0	0	0	0
17.1099 Construction and maintenance trades, other	1,767	1,351	36	261	118
17.1100 Custodial services	29	24	2	0	2
17.1200 Diesel mechanic	4,471	2,459	217	664	1,130
17.1300 Drafting occupations	9,274	3,524	796	1,610	3,341
17.1400 Electrical occupations, other	2,930	1,308	280	234	1,099
17.1503 Radio and TV repair	2,271	1,305	125	477	366
17.1599 Electronics occupations, other	23,417	12,517	1,393	3,801	5,705
17.1600 Fabric maintenance services	476	476	0	0	0
17.1700 Supervisor and management development	1,239	724	69	186	260
17.1900 Graphic arts occupations	2,876	1,462	261	659	495
17.2000 Industrial atomic energy occupations	0	0	0	0	0
17.2100 Instrument maintenance and repair occupations	2,497	1,101	181	205	1,009
17.2200 Maritime occupations	6,649	6,305	44	199	100
17.2302 Machine shop occupations	265	115	71	74	5
17.2303 Machine tool operations	1,451	1,332	0	12	108
17.2306 Welding and cutting	19,119	11,910	2,487	2,466	2,254
17.2307 Tool and diemaking	316	54	95	60	107
17.2399 Metalworking, other	345	342	2	1	0
17.2400 Metallurgy occupations	111	64	6	17	23
17.2601 Barbering	9,337	6,586	30	1,199	1,521
17.2602 Cosmetology	126,590	66,518	2,724	23,812	33,535
17.2699 Personal services, other	4,358	3,475	193	431	259
17.2700 Plastics occupations	24	24	0	0	0
17.2801 Firefighter training	0	0	0	0	0
17.2802 Law enforcement training	1,487	1,467	19	0	0
17.2899 Public service occupations, other	0	0	0	0	0
17.2900 Quantity food occupations	16,061	13,826	680	1,162	393
17.3000 Refrigeration engineering	383	216	18	45	103
17.3100 Small engine repair, internal combustion	2,067	1,523	117	176	249
17.3200 Stationary energy sources	217	127	12	32	45
17.3300 Textile production and fabrication	1,873	1,097	40	241	496
17.3400 Leatherworking	0	0	0	0	0
17.3500 Upholstering	479	348	6	110	15
17.3600 Woodworking occupations	5	5	0	0	0
17.4000 Truckdriving	26,326	17,271	162	3,452	5,441
17.5000 Dog grooming	2,848	2,345	14	263	226
17.9900 Trade and industrial occupations, other	932	183	0	31	716
Not reported	45,436	27,903	1,959	6,345	9,230

[1] Table does not include collegiate, flight, and other schools.

SOURCE: U.S. Department of Education, National Center for Education Statistics.

Table D-3. Apprenticeship registration actions, calendar year 1979

Trade	Beginning of period 1-1-79	During period			End of period 12-31-79
		Added	Cancelled[1]	Completed	
U.S. totals	289,168	136,786	58,634	43,454	323,866
Technologists and technicians, except health:					
Drafters, designers	841	317	230	124	804
Service occupations:					
Food and beverage preparation and service occupations:					
Butchers, meatcutters	2,259	1,007	499	694	2,073
Cooks, bakers	2,352	1,168	625	194	2,701
Personal service occupations:					
Barbers, beauticians	1,403	1,066	604	491	1,374
Mechanics and repairers:					
Air-conditioning and refrigeration mechanics	2,041	855	399	294	2,203
Aircraft mechanics	660	134	32	26	736
Auto and related body repairers	3,207	1,260	739	346	3,382
Auto and related mechanics	9,909	4,786	2,524	1,466	10,705
Car repairers	3,149	1,259	708	680	3,020
Electronic technicians	1,610	622	146	310	1,776
Industrial technicians	1,310	488	222	178	1,398
Maintenance mechanics	4,853	1,946	744	913	5,142
Millwrights	5,636	2,241	679	1,038	6,160
Office machine servicers	1,084	233	241	146	930
Radio, TV repairers	718	176	190	130	574
Not classified above	4,344	2,058	771	757	4,874
Construction occupations:					
Bricklayers, stone and tile setters	8,488	3,884	1,992	1,068	9,312
Carpenters	43,212	23,672	13,397	4,637	48,850
Cement masons	3,092	1,792	824	466	3,594
Electrical workers	920	424	228	170	946
Electricians	35,118	13,833	4,843	4,961	39,147
Floor coverers	1,697	955	523	228	1,901
Glaziers	1,143	688	323	189	1,319
Insulation workers	1,683	504	194	235	1,758
Lathers	1,357	804	400	155	1,606
Line erectors, light and power	4,651	2,173	754	816	5,254
Ornamental ironworkers	166	48	14	15	185
Painters	6,732	3,941	1,991	956	7,726
Pipefitters, sprinkler fitters, steamfitters	15,859	5,755	1,662	3,089	16,863
Plasterers	1,229	827	347	121	1,588
Plumbers	17,607	5,965	2,482	2,322	18,768
Roofers	5,670	4,335	2,410	539	7,056
Sheet-metal workers	11,265	4,773	1,771	1,591	12,676
Structural steel workers	8,066	5,145	1,370	1,568	10,273
Tapers, dry-wall applicators	1,910	1,136	803	412	1,831
Not classified above	1,394	639	477	283	1,273
Production occupations:					
Precision production occupations:					
Boilermakers	3,931	1,381	417	769	4,126
Bookbinders, bindery workers	631	273	108	90	706
Cabinetmakers, wood machinists	1,968	1,039	629	242	2,136
Compositors	385	100	94	70	321
Lithographers, photoengravers	2,173	724	653	369	1,875
Machinists	15,528	6,397	2,748	2,450	16,727
Medical and dental technicians	3,457	2,882	529	226	5,584
Molders, coremakers	646	257	139	97	667
Optical workers	389	109	119	49	330
Patternmakers	852	383	74	143	1,018
Printing and publishing workers	875	396	111	80	1,080
Toolmakers, diemakers	12,730	5,379	2,044	1,807	14,258
Plant and system operators:					
Stationary engineers	1,899	713	212	448	1,952
Machine operators, tenders, and setup workers:					
Machine set-up and operators	1,437	699	353	205	1,578
Press operators	1,134	258	189	187	1,016
Transportation and material moving occupations:					
Operating engineers (construction machinery operators)	5,496	2,775	875	857	6,539
Miscellaneous trades, not classified above	19,002	12,112	3,182	3,757	24,175

[1] Includes voluntary quits, layoffs, discharges, out-of-State transfers, upgrades within certain trades, and suspensions or interruptions for military service.

SOURCE: U.S. Department of Labor, Bureau of Apprenticeship and Training.

Table D-4. Enlisted strength in Department of Defense (DOD) occupational groups, September 30, 1980

DOD code	Group title and description of coverage	Enlisted strength
0	INFANTRY, GUN CREWS, AND SEAMANSHIP SPECIALISTS	242,389
01	*Infantry* — includes weapon specialists, ground reconnaissance specialists and crew-served artillery specialists, armor and amphibious crews, and specialists in combat engineering and seamanship	103,703
02	*Armor and Amphibious*	24,554
03	*Combat Engineering* — includes specialists in hasty and temporary construction of airfields, roads, and bridges and in demolition, field illumination, and chemical warfare	20,937
04	*Artillery/Gunnery, Rockets, and Missiles* — includes conventional field, anti-air and shipboard guns and artillery, and rocket and missile specialists	50,858
05	*Air Crew* — includes pilots and navigators, flight engineers, and other air crew	6,414
06	*Seamanship* — includes boatswains, navigators, and other seamanship specialists	13,885
07	*Installation Security* — includes specialists who guard weapon systems, defend installations, and protect personnel, equipment, and facilities	22,038
1	ELECTRONIC EQUIPMENT REPAIRERS	154,559
10	*Radio/Radar* — includes fixed and mobile radio, air traffic and tracking radar, communication, navigation, and electronic countermeasure gear	70,809
11	*Fire Control Electronic System (Non-Missile)*	7,519
12	*Missile Guidance, Control and Checkout* — includes specialists in guidance, control, and checkout equipment for guided and ballistic missiles	22,533
13	*Sonar Equipment* — includes specialists in underwater detection and fire control systems, oceanographic equipment, and related antisubmarine gear	7,813
14	*Nuclear Weapons Equipment*	1,321
15	*ADP Computers*	7,569
16	*Teletype and Cryptographic Equipment*	13,684
19	*Other Electronic Equipment* — includes training devices, inertial navigation systems, and electronics instruments specialists	23,311
2	COMMUNICATIONS AND INTELLIGENCE SPECIALISTS	145,012
20	*Radio and Radio Code* — includes operators of radio, radio teletype, and visual communications equipment	41,695
21	*Sonar*	4,257
22	*Radar and Air Traffic Control*	24,754
23	*Signal Intelligence/Electronic Warfare* — includes the intercept, translation, and analysis of foreign communications, and the operation of electronic countermeasures equipment	21,548
24	*Intelligence* — includes the gathering, receipt, and analysis of nonsignal intelligence data, the interrogation of prisoners, other language translators and interpreters, image interpretation, and specialists in counterintelligence and investigational activities	8,830
25	*Combat Operations Control* — includes specialists in forward area tactical operations and intelligence and in command post control activities	21,444
26	*Communications Center Operations* — includes the receipt and distribution of messages, the operation of communications center equipment, and the operation of major field communications systems	22,484
3	MEDICAL AND DENTAL SPECIALISTS	77,604
30	*Medical Care*	53,172
31	*Technical Medical Services* — includes laboratory, pharmaceutical, and X-ray services	10,461
32	*Related Medical Services* — includes specialists in sanitation, health preservation, and veterinary services and preventive medical services	4,931
33	*Dental Care* — Includes specialists in dental care and treatment and in related technical and laboratory services	9,040
4	OTHER TECHNICAL AND ALLIED SPECIALISTS	37,723
40	*Photography* — includes still, motion, and television camera operators, precision photographic processing, editing, and broadcasting	6,081
41	*Mapping, Surveying, Drafting, and Illustrating*	7,197
42	*Weather* — includes specialists in the collection of weather and sea condition data and in weather forecasting	5,283
43	*Ordnance Disposal and Diving* — includes the excavation and rendering safe of explosive ordnance and of chemical and nuclear agents, and underwater demolition and other types of diving	1,507
45	*Musicians*	4,609
49	*Technical Specialists, N.E.C.* — includes physical science laboratory analysts, specialists in memorial activities, safety, NBC warfare, and firefighting and damage control, and other technical specialists and aids such as scientific engineering assistants	13,046

Table D-4. Enlisted strength in Department of Defense (DOD) occupational groups, September 30, 1980—Continued

DOD code	Group title and description of coverage	Enlisted strength
5	FUNCTIONAL SUPPORT AND ADMINISTRATION	269,849
50	*Personnel* — includes specialists in personnel administration, personnel and manpower management, and recruiting and counseling	45,361
51	*Administration* — includes clerks, typists, and stenographers and legal and medical administrative specialists	72,645
52	*Clerical/Personnel* — includes combined personnel and administrative specialists and senior enlisted personnel whose primary responsibilities are non-technical	6,379
53	*Data Processing* — includes computer operators, analysts, and programmers and electric accounting machine operators	14,089
54	*Accounting, Finance, and Disbursing*	14,123
55	*Other Functional Support* — includes specialists who provide support in the functional areas of supply accounting and procurement, transportation, flight operations, and related areas	106,371
56	*Religious, Morale, and Welfare* — includes chaplains' assistants and specialists in theater, arts, sports, and related activities	5,061
57	*Information and Education* — includes specialists in public affairs, radio/TV, and other types of information and education	5,820
6	ELECTRICAL/MECHANICAL EQUIPMENT REPAIRERS	348,461
60	*Aircraft and Related* — includes aircraft engines, electrical systems, structural components and surfaces, and launch equipment	153,476
61	*Automotive* — includes construction equipment and other wheel and track vehicles	59,694
62	*Wire Communications* — includes specialists in the installation and maintenance of telephones, switchboards, and central office and related interior communications equipment	27,410
63	*Missile, Mechanical and Electrical* — includes missiles and missile systems and related components	4,812
64	*Armament and Munitions* — includes small arms, artillery, mines, bombs and associated mountings, nuclear weapons, and ammunition renovation	34,187
65	*Shipboard Propulsion* — includes marine main engines, boilers, and auxiliary equipment	37,551
66	*Power Generating Equipment* — includes nuclear power reactors and primary electric generating plants	26,934
67	*Precision Equipment* — includes optical and other precision instruments and office machines	2,687
69	*Other Mechanical and Electrical Equipment* — includes specialists in the maintenance and repair of mechanical and electrical equipment which is not readily classifiable in another group	1,710
7	CRAFT WORKERS	70,636
70	*Metalworking* — includes specialists in the machining, shaping, and forming of metal and in the fabrication of metal parts	13,260
71	*Construction* — includes specialists in construction trades and construction equipment operation	24,826
72	*Utilities* — includes plumbers, heating and cooling specialists, and electricians	18,230
74	*Lithography*	2,004
75	*Industrial Gas and Fuel Production* — includes specialists in the production of liquid oxygen, hydrogen, nitrogen, and carbon dioxide	656
76	*Fabric, Leather, and Rubber*	2,660
79	*Other Craft Workers, N.E.C.* — includes specialists in trades such as molding, camouflage, and plastic work, which are not readily classifiable elsewhere in this section	9,000
8	SERVICE AND SUPPLY HANDLERS	156,228
80	*Food Service*	46,442
81	*Motor Transport* — includes the operation of wheel and track vehicles (except construction equipment) and railway equipment	31,858
82	*Material Receipt, Storage, and Issue* — includes specialists in the receipt, storage, issue, and shipment of general and specialized classes of supplies, excluding ammunition	30,877
83	*Law Enforcement* — includes military police, protective and corrections specialists, and criminal and noncriminal inspectors and investigators	39,181
84	*Personal Service* — includes laundry, dry cleaning, and related services	1,918
86	*Forward Area Equipment* — includes specialists in parachute packing and repair, in aerial delivery operations, and in flight equipment fitting and maintenance	5,952

NOTE: Definitions are provided for most occupational groups. The lack of explanatory material for a few occupational groups indicates that the title of the grouping is considered a sufficient definition.

SOURCE: U.S. Department of Defense, Defense Manpower Data Center—Enlisted Master File.

Table D-5. Associate degrees and other formal awards by length of curriculum and type of credit, 1979-80[1]

Curriculum	HEGIS code[2]	Curriculums of at least 2 but less than 4 years		Curriculums of at least 1 but less than 2 years
		Work wholly or chiefly creditable toward a bachelor's degree	Work not wholly or chiefly creditable toward a bachelor's degree	
All curriculums, total	-	291,919	143,208	77,814
Arts and science or general programs	-	148,197	6,577	3,060
Occupational curriculums, total	-	143,722	136,631	74,754
Business and commerce technologies	5000	57,819	46,514	21,928
Business and commerce technologies, general	5001	12,192	8,993	2,371
Accounting technologies	5002	7,558	6,074	2,080
Banking and finance technologies	5003	450	645	149
Marketing distribution, purchasing, business and industrial management	5004	15,360	12,349	1,927
Secretarial technologies (includes office machine training)	5005	12,653	10,801	9,837
Personal service technologies (flight attendant, cosmetologist, etc.)	5006	189	777	2,686
Photography technologies	5007	418	462	134
Communications and broadcasting technologies (radio/television, newspapers)	5008	1,299	718	133
Printing and lithography technologies	5009	385	362	238
Hotel and restaurant management technologies	5010	1,081	1,152	188
Transportation and public utilities technologies	5011	463	438	530
Applied arts, graphic arts, and fine arts technologies (includes advertising design)	5012	4,437	2,793	1,279
Other	5099	1,334	950	376
Data processing technologies	5100	6,175	6,385	2,587
Data processing technologies, general	5101	3,729	2,760	644
Keypunch operator and other input preparation technologies	5102	94	102	692
Computer programmer technologies	5103	1,687	3,033	544
Computer operator and peripheral equipment operation technologies	5104	294	221	645
Data processing equipment maintenance technologies	5105	312	193	56
Other	5199	59	76	6
Health services and paramedical technologies	5200	34,198	32,109	20,172
Health services assistant	5201	918	1,117	1,585
Dental assistant technologies	5202	656	590	2,071
Dental hygiene technologies	5203	2,183	1,781	90
Dental laboratory technologies	5204	298	554	59
Medical or biological laboratory assistant technologies	5205	1,830	1,618	235
Animal laboratory assistant technologies	5206	499	591	41
Radiologic technologies (X-ray, etc.)	5207	1,795	1,803	84
Nursing, R.N. (less than 4-year program)	5208	19,211	16,323	160
Nursing, practical (L.P.N. or L.V.N.-less than 4-year program)	5209	1,216	1,667	10,946
Occupational therapy technologies	5210	451	363	52
Surgical technologies	5211	101	156	871
Optical technologies (includes ocular care, ophthalmic, optometric technologies)	5212	363	350	70
Medical record technologies	5213	451	492	188
Medical assistant and medical office assistant technologies	5214	1,017	1,125	2,192
Inhalation therapy technologies	5215	1,153	1,218	830
Psychiatric technologies (includes mental health aide programs)	5216	885	925	239
Electrodiagnostic technologies (includes EKG,EEG, etc.)	5217	36	87	32
Institutional management technologies (rest home, etc.)	5218	86	155	37
Physical therapy technologies	5219	380	635	18
Other	5299	669	559	372
Mechanical and engineering technologies	5300	21,548	29,692	21,264
Mechanical and engineering technologies, general	5301	2,452	2,470	816
Aeronautical and aviation technologies	5302	2,346	1,396	703
Engineering graphics (tool and machine drafting and design)	5303	1,026	1,579	1,019
Architectural drafting technologies	5304	1,128	1,672	430
Chemical technologies (includes plastics)	5305	442	259	80
Automotive technologies	5306	1,151	3,270	3,865
Diesel technologies	5307	306	1,288	968
Welding technologies	5308	306	836	2,669
Civil technologies (surveying, photogrammetry, etc.)	5309	989	1,047	132
Electronics and machine technologies (television, appliance, office machine repair, etc.)	5310	4,901	7,752	2,147
Electromechanical technologies	5311	882	937	325
Industrial technologies	5312	810	1,275	1,341

See footnotes at end of table.

Table D-5. Associate degrees and other formal awards by length of curriculum and type of credit, 1979-80[1]—Continued

Curriculum	HEGIS code[2]	Curriculums of at least 2 but less than 4 years		Curriculums of at least 1 but less than 2 years
		Work wholly or chiefly creditable toward a bachelor's degree	Work not wholly or chiefly creditable toward a bachelor's degree	
Textile technologies	5313	87	209	75
Instrumentation technologies	5314	214	423	166
Mechanical technologies	5315	1,308	1,210	1,029
Nuclear technologies	5316	24	112	25
Construction and building technologies (carpentry, electric work, plumbing, sheet-metal, air conditioning, heating, etc.)	5317	2,225	3,164	4,837
Other	5399	949	793	637
Natural science technologies	5400	7,388	7,196	4,782
Natural science technologies, general	5401	640	160	256
Agriculture technologies (includes horticulture)	5402	2,752	3,176	2,713
Forestry and wildlife technologies (includes fisheries)	5403	447	1,080	125
Food services technologies	5404	2,180	915	691
Home economics technologies	5405	622	780	705
Marine and oceanographic technologies	5406	101	320	2
Laboratory technologies, general	5407	195	47	-
Sanitation and public health inspection technologies (environmental health technologies)	5408	162	302	174
Other	5499	289	416	116
Public-service-related technologies	5500	16,594	14,735	4,021
Public service technologies, general	5501	1,330	945	390
Bible study or religion-related occupations	5502	1,479	225	127
Education technologies (teacher aide and 2-year teacher training programs)	5503	3,139	2,648	837
Library assistant technologies	5504	156	280	101
Police, law enforcement, correction technologies	5505	6,757	6,319	1,389
Recreation and social work and related technologies	5506	2,204	1,658	203
Fire control technology	5507	646	1,410	373
Public administration and management technologies	5508	242	447	163
Other	5599	641	803	438

[1] These data do not include associate degrees and other formal awards below the baccalaureate granted in specific arts and sciences curriculums.

[2] HEGIS codes are from the Higher Education General Information Survey. See a *A Taxonomy of Instructional Programs in Higher Education* (U.S. Department of Education, 1970).

SOURCE: U.S. Department of Education, National Center for Education Statistics.

Table D-8. Bachelor's, master's, and doctor's degrees conferred in institutions of higher education by field of study, 1979–80

HEGIS code	Major field of study	Bachelor's degrees requiring 4 or 5 years	Master's degrees	Doctor's degrees (Ph.D., Ed.D., etc.)
	All fields	929,417	298,081	32,615
0100	AGRICULTURE AND NATURAL RESOURCES	22,802	3,976	991
0101	Agriculture, general	2,243	328	26
0102	Agronomy	1,786	441	174
0103	Soils science	731	152	56
0104	Animal science	3,684	472	136
0105	Dairy science	251	68	25
0106	Poultry science	111	49	12
0107	Fish, game, and wildlife management	1,314	324	72
0108	Horticulture	1,747	254	80
0109	Ornamental horticulture	633	17	3
0110	Agriculture and farm management	235	2	–
0111	Agricultural economics	1,780	561	164
0112	Agricultural business	1,463	38	–
0113	Food science and technology	824	337	94
0114	Forestry	2,377	437	80
0115	Natural resources management	1,936	235	30
0116	Agriculture and forestry technologies	207	16	8
0117	Range management	311	63	17
0199	Other	1,169	182	14
0200	ARCHITECTURE AND ENVIRONMENTAL DESIGN	9,132	3,139	79
0201	Environmental design, general	943	135	2
0202	Architecture	5,465	1,425	24
0203	Interior design	902	83	–
0204	Landscape architecture	1,006	216	–
0205	Urban architecture	3	131	7
0206	City, community, and regional planning	395	1,054	45
0299	Other	418	95	1
0300	AREA STUDIES	2,489	772	145
0301	Asian studies, general	173	89	7
0302	East Asian studies	157	70	12
0303	South Asian (India, etc.) studies	13	11	2
0304	Southeast Asian studies	5	17	–
0305	African studies	13	15	6
0306	Islamic studies	–	–	–
0307	Russian and Slavic studies	96	44	–
0308	Latin American studies	277	130	3
0309	Middle Eastern studies	34	43	10
0310	European studies, general	45	14	–
0311	Eastern European studies	3	1	–
0312	West European studies	15	3	–
0313	American studies	1,288	199	78
0314	Pacific area studies	–	4	–
0399	Other	370	132	27
0400	BIOLOGICAL SCIENCES	46,370	6,510	3,636
0401	Biology, general	33,523	2,911	718
0402	Botany, general	724	300	161
0403	Bacteriology	284	51	28
0404	Plant pathology	70	171	104
0405	Plant pharmacology	–	–	–
0406	Plant physiology	26	18	9
0407	Zoology, general	3,653	431	245
0408	Pathology, human and animal	40	72	103
0409	Pharmacology, human and animal	33	84	213
0410	Physiology, human and animal	386	238	240
0411	Microbiology	2,347	545	348
0412	Anatomy	1	90	144
0413	Histology	15	4	–
0414	Biochemistry	1,686	268	475
0415	Biophysics	103	50	90
0416	Molecular biology	254	21	72
0417	Cell biology	50	32	21
0418	Marine biology	450	104	13
0419	Biometrics and biostatistics	15	95	29
0420	Ecology	867	199	54
0421	Entomology	262	253	154

Table D-6. Bachelor's, master's, and doctor's degrees conferred in institutions of higher education by field of study, 1979-80—Continued

HEGIS code	Major field of study	Bachelor's degrees requiring 4 or 5 years	Master's degrees	Doctor's degrees (Ph.D., Ed.D., etc.)
0422	Genetics	73	124	124
0423	Radiobiology	2	24	7
0424	Nutrition, scientific	116	171	68
0425	Neurosciences	64	17	41
0426	Toxicology	36	43	15
0427	Embryology	–	–	–
0499	Other	1,290	194	160
0500	BUSINESS AND MANAGEMENT	186,683	55,148	796
0501	Business and commerce, general	34,457	10,650	113
0502	Accounting	42,712	3,456	51
0503	Business statistics	256	99	10
0504	Banking and finance	11,019	3,604	37
0505	Investments and securities	147	104	–
0506	Business management and administration	61,593	30,186	410
0507	Operations research	494	522	39
0508	Hotel and restaurant management	1,714	76	1
0509	Marketing and purchasing	22,153	1,951	35
0510	Transportation and public utilities	1,322	142	4
0511	Real estate	866	86	3
0512	Insurance	561	40	4
0513	International business	493	1,220	8
0514	Secretarial studies	1,620	7	–
0515	Personnel management	2,109	1,035	9
0516	Labor and industrial relations	1,352	785	14
0517	Business economics	2,533	307	48
0599	Other	1,282	878	10
0600	COMMUNICATIONS	28,616	3,082	193
0601	Communications, general	11,588	1,558	139
0602	Journalism	8,457	866	30
0603	Radio–television	4,482	242	10
0604	Advertising	1,940	118	–
0605	Communication media	1,689	171	11
0699	Other	460	127	3
0700	COMPUTER AND INFORMATION SCIENCES	11,154	3,647	240
0701	Computer and information sciences, general	9,118	3,324	220
0702	Information sciences and systems	1,210	265	18
0703	Data processing	580	6	–
0704	Computer programming	148	–	–
0705	Systems analysis	38	25	1
0799	Other	60	27	1
0800	EDUCATION	118,102	103,453	7,940
0801	Education, general	3,816	13,296	1,321
0802	Elementary education, general	42,042	15,891	214
0803	Secondary education, general	3,306	5,492	196
0804	Junior high school education	338	93	–
0805	Higher education, general	3	469	421
0806	Junior and community college education	2	255	168
0807	Adult and continuing education	49	948	140
0808	Special education, general	8,897	8,979	260
0809	Administration of special education	8	34	15
0810	Education of the mentally retarded	2,066	790	8
0811	Education of the gifted	17	46	2
0812	Education of the deaf	378	376	1
0813	Education of the culturally disadvantaged	5	95	2
0814	Education of the visually handicapped	76	104	1
0815	Speech correction	1,399	503	4
0816	Education of the emotionally disturbed	463	553	3
0817	Remedial education	–	131	2
0818	Special learning disabilities	875	1,479	22
0819	Education of the physically handicapped	117	60	2
0820	Education of the multiple handicapped	72	80	–
0821	Social foundations	37	449	209
0822	Educational psychology	131	2,132	627
0823	Pre-elementary education	4,865	1,660	45
0824	Educational statistics and research	2	62	52
0825	Educational testing, evaluation, and measurement	41	143	24
0826	Student personnel	194	13,197	649
0827	Educational administration	11	9,679	1,468

Table D-6. Bachelor's, master's, and doctor's degrees conferred in institutions of higher education by field of study, 1979-80—Continued

HEGIS code	Major field of study	Bachelor's degrees requiring 4 or 5 years	Master's degrees	Doctor's degrees (Ph.D., Ed.D., etc.)
0828	Educational supervision	50	1,107	64
0829	Curriculum and instruction	268	3,957	751
0830	Reading education	335	6,299	124
0831	Art education	2,606	780	41
0832	Music education	6,220	1,149	105
0833	Mathematics education	762	512	39
0834	Science education	672	591	73
0835	Physical education	20,316	4,126	262
0836	Driver and safety education	132	231	4
0837	Health education	2,377	1,033	60
0838	Business, commerce, and distributive education	3,875	1,307	61
0839	Industrial arts, vocational and technical education	6,539	2,484	281
0899-1	Agricultural education	1,058	287	29
0899-2	Education of exceptional children, not classified above	115	49	–
0899-3	Home economics education	2,078	481	10
0899-4	Nursing education	221	50	–
0899	Other	1,269	2,014	181
0900	ENGINEERING	68,893	16,243	2,507
0901	Engineering, general	3,977	1,597	282
0902	Aerospace, aeronautical, astronautical engineering	1,424	382	99
0903	Agricultural engineering	745	152	61
9094	Architectural engineering	319	43	–
0905	Bioengineering and biomedical engineering	396	209	49
0906	Chemical engineering	6,320	1,270	284
0907	Petroleum engineering	893	122	25
0908	Civil, construction, and transportation engineering	10,326	2,683	270
0909	Electrical, electronics, communications engineering	13,821	3,836	525
0910	Mechanical engineering	11,808	2,060	281
0911	Geological engineering	222	36	2
0912	Geophysical engineering	56	16	4
0913	Industrial and management engineering	3,175	1,313	116
0914	Metallurgical engineering	585	211	82
0915	Materials engineering	429	319	120
0916	Ceramic engineering	253	36	18
0917	Textile engineering	55	8	–
0918	Mining and mineral engineering	682	87	7
0919	Engineering physics	254	52	18
0920	Nuclear engineering	495	365	101
0921	Engineering mechanics	157	134	63
0922	Environmental and sanitary engineering	285	472	39
0923	Naval architecture and marine engineering	552	64	7
0924	Ocean engineering	167	102	8
0925	Engineering technologies	10,491	339	5
0999	Other	1,007	335	41
1000	FINE AND APPLIED ARTS	40,892	8,708	655
1001	Fine arts, general	4,310	651	31
1002	Art	13,221	2,177	2
1003	Art history and appreciation	1,966	346	123
1004	Music (performing, composition, theory)	5,405	2,663	289
1005	Music (liberal arts program)	3,341	619	72
1006	Music history and appreciation	204	135	41
1007	Dramatic arts	5,191	1,117	91
1008	Dance	818	244	3
1009	Applied design	4,163	315	1
1010	Cinematography	579	132	1
1011	Photography	1,037	85	1
1099	Other	657	224	–
1100	FOREIGN LANGUAGES	11,133	2,236	549
1101	Foreign languages, general	689	394	130
1102	French	3,285	513	128
1103	German	1,466	309	94
1104	Italian	272	49	9
1105	Spanish	4,331	685	103
1106	Russian	402	60	6
1107	Chinese	79	33	7
1108	Japanese	108	14	4
1109	Latin	95	14	2

Table D-6. Bachelor's, master's, and doctor's degrees conferred in institutions of higher education by field of study, 1979-80—Continued

HEGIS code	Major field of study	Bachelor's degrees requiring 4 or 5 years	Master's degrees	Doctor's degrees (Ph.D., Ed.D., etc.)
1110	Greek, classical	77	9	6
1111	Hebrew	78	36	5
1112	Arabic	13	2	5
1113	Indian (Asiatic)	–	–	2
1114	Scandinavian languages	40	4	4
1115	Slavic languages (other than Russian)	53	51	25
1116	African languages (non-Semitic)	–	8	2
1199	Other	145	53	17
1200	HEALTH PROFESSIONS	63,920	15,704	788
1201	Health professions, general	5,219	788	61
1202	Hospital and health care administration	1,692	1,683	13
1203	Nursing	32,441	4,616	118
1205	Dental specialties	75	382	10
1207	Medical specialties	–	69	38
1208	Occupational therapy	1,666	205	–
1209-2	Optometry	392	9	2
1211-2	Pharmacy	6,974	380	89
1212	Physical therapy	2,338	282	2
1213	Dental hygiene	1,238	30	–
1214	Public health	586	2,574	182
1215	Medical record librarianship	657	–	–
1216-2	Podiatry or podiatric medicine	–	2	–
1217	Biomedical communication	33	5	–
1219	Veterinary medicine specialties	–	148	67
1220	Speech pathology and audiology	3,576	3,290	110
1221-2	Chiropractic	105	–	–
1222	Clinical social work	313	636	15
1223	Medical laboratory technologies	5,092	231	1
1224	Dental technologies	2	–	–
1225	Radiologic technologies	466	47	6
1299	Other	1,055	327	72
1300	HOME ECONOMICS	18,411	2,690	192
1301	Home economics, general	6,183	871	71
1302	Home decoration and home equipment	820	46	–
1303	Clothing and textiles	3,254	127	13
1304	Consumer economics and home management	706	91	17
1305	Family relations and child development	3,263	692	56
1306	Foods and nutrition	3,167	756	31
1307	Institutional management and cafeteria management	555	57	1
1399	Other	463	50	3
1400	LAW	683	1,817	40
1401-2	Law, general	621	1,083	37
1499	Other	62	734	3
1500	LETTERS	40,633	8,509	1,875
1501	English, general	23,501	4,187	845
1502	Literature, English	2,107	415	140
1503	Comparative literature	354	163	98
1504	Classics	404	97	44
1505	Linguistics	552	521	162
1506	Speech, debate, and forensic science	5,630	1,060	171
1507	Creative writing	272	260	4
1508	Teaching of English as a foreign language	67	498	1
1509	Philosophy	3,695	509	246
1510	Religious studies	3,374	695	128
1599	Other	677	104	36
1600	LIBRARY SCIENCE	398	5,374	73
1601	Library science, general	387	5,296	65
1699	Other	11	78	8
1700	MATHEMATICS	11,378	2,860	724
1701	Mathematics, general	10,492	2,087	552
1702	Statistics, mathematical and theoretical	247	495	115
1703	Applied mathematics	396	179	41
1799	Other	243	99	16
1800	MILITARY SCIENCES	251	46	–
1801	Military science (Army)	2	46	–

Table D-8. Bachelor's, master's, and doctor's degrees conferred in institutions of higher education by field of study, 1979-80—Continued

HEGIS code	Major field of study	Bachelor's degrees requiring 4 or 5 years	Master's degrees	Doctor's degrees (Ph.D., Ed.D., etc.)
1802	Naval science (Navy, Marines)	2	–	–
1803	Aerospace science (Air Force)	10	–	–
1899-1	Merchant marine	213	–	–
1899	Other	24	–	–
1900	PHYSICAL SCIENCES	23,410	5,219	3,089
1901	Physical sciences, general	1,024	125	20
1902	Physics, general	3,296	1,177	818
1903	Molecular physics	3	–	2
1904	Nuclear physics	97	15	10
1905	Chemistry, general	11,214	1,615	1,413
1906	Inorganic chemistry	10	7	19
1907	Organic chemistry	–	25	30
1908	Physical chemistry	3	16	23
1909	Analytical chemistry	2	8	15
1910	Pharmaceutical chemistry	3	52	45
1911	Astronomy	96	70	72
1912	Astrophysics	26	9	20
1913	Atmospheric sciences and meteorology	367	170	66
1914	Geology	4,439	1,192	260
1915	Geochemistry	4	8	10
1916	Geophysics and seismology	154	95	43
1917	Earth sciences, general	931	183	46
1918	Paleontology	5	3	2
1919	Oceanography	252	142	79
1920	Metallurgy	36	32	12
1999-1	Other earth sciences	391	85	17
1999-2	Other physical sciences	1,057	190	67
2000	PSYCHOLOGY	41,962	7,806	2,768
2001	Psychology, general	40,254	4,581	1,899
2002	Experimental psychology	31	62	56
2003	Clinical psychology	3	592	428
2004	Psychology for counseling	149	1,797	187
2005	Social psychology	298	272	69
2006	Psychometrics	–	31	3
2007	Statistics in psychology	50	5	1
2008	Industrial psychology	291	87	5
2009	Developmental psychology	31	209	52
2010	Physiological psychology	855	11	18
2099	Other		159	50
2100	PUBLIC AFFAIRS AND SERVICES	37,555	20,087	392
2101	Community services, general	1,527	406	28
2102	Public administration	1,831	6,586	131
2103	Parks and recreation management	5,753	647	21
2104	Social work and helping services	12,459	10,065	162
2105	Law enforcement and corrections	15,015	1,805	18
2106	International public service	143	75	11
2199	Other	827	503	21
2200	SOCIAL SCIENCES	103,870	12,181	3,225
2201	Social sciences, general	8,503	1,252	81
2202	Anthropology	3,592	832	359
2203	Archaeology	69	29	8
2204	Economics	17,863	1,821	677
2205	History	19,301	2,367	712
2206	Geography	3,443	579	138
2207	Political science and government	25,457	1,938	535
2208	Sociology	18,881	1,341	583
2209	Criminology	2,453	243	8
2210	International relations	1,674	816	53
2211	Afro-American (black culture) studies	261	59	6
2212	American Indian cultural studies	11	–	–
2213	Mexican-American cultural studies	79	21	–
2214	Urban studies	1,092	671	22
2215	Demography	17	24	9
2299	Other	1,174	188	34
2300	THEOLOGY	6,207	3,922	1,319
2301-2	Theological professions, general	3,708	2,282	1,209
2302	Religious music	262	219	16

Table D-6. Bachelor's, master's, and doctor's degrees conferred in institutions of higher education by field of study, 1979-80—Continued

HEGIS code	Major field of study	Bachelor's degrees requiring 4 or 5 years	Master's degrees	Doctor's degrees (Ph.D., Ed.D., etc.)
2303	Biblical languages	37	50	4
2304	Religious education	1,886	1,202	44
2399	Other	314	169	46
4900	INTERDISCIPLINARY STUDIES	34,473	4,952	401
4901	General liberal arts and sciences	20,069	1,373	106
4902	Biological and physical sciences	3,105	318	30
4903	Humanities and social sciences	3,127	1,273	86
4904	Engineering and other disciplines	466	935	17
4999	Other	7,706	1,053	162

NOTE: Dash indicates data are not available.

SOURCE: U.S. Department of Education, National Center for Education Statistics.

Table D-7. First professional degrees[1] conferred by institutions of higher education, 1979-80

Field of study	First professional degrees
Total, all institutions	70,131
Chiropractic (D.C. or D.C.M.)	2,061
Dentistry (D.D.S. or D.M.D.)	5,258
Medicine (M.D.)	14,902
Optometry (O.D.)	1,085
Osteopathic Medicine (D.O.)	1,011
Pharmacy (D. Phar.)	637
Podiatry (Pod. D. or D.P.) or Podiatric Medicine (D.P.M.)	580
Veterinary Medicine (D.V.M.)	1,835
Law (LL.B. or J.D.)	35,647
Theology (B.D., M. Div., or Rabbi)	7,115
Other	–

[1] Includes degrees that require at least 6 years of college work for completion (including at least 2 years of preprofessional training).

SOURCE: U.S. Department of Education, National Center for Education Statistics.

Appendix E. State Employment Security Agencies

State employment security agencies develop occupational projections and related employment statistics in cooperation with the Bureau of Labor Statistics. The following list shows where to write or call for this information:

Alabama
Chief, Research and Statistics Division
Alabama Department of Industrial Relations
Industrial Relations Building, Room 427
Montgomery, Alabama 36130
Phone: (205) 832-5263

Alaska
Chief, Research and Analysis Section
Employment Security Division
Alaska Department of Labor
P.O. Box 3-7000
Juneau, Alaska 99802
Phone: (907) 465-4505

Arizona
Research Chief, LMI
Research & Analysis Section 733A
Arizona Department of Economic Security
P.O. Box 6123
Phoenix, Arizona 85005
Phone: (602) 255-3616

Arkansas
Chief, Research and Analysis Section
Employment Security Division
Arkansas Department of Labor
State Capitol Mall
P.O. Box 2981
Little Rock, Arkansas 72203
Phone: (501) 371-1541

California
Chief, Employment Data and Research Division
Employment Development Department
P.O. Box 1679
Sacramento, California 95808
Phone: (916) 445-4434

Colorado
Chief, Research and Development
Colorado Division of Employment and Training
1278 Lincoln Street
Denver, Colorado 80203
Phone: (303) 866-6316

Connecticut
Director, Research and Information
Employment Security Division
Connecticut Labor Department
200 Folly Brook Boulevard
Hartford, Connecticut 06115
Phone: (203) 566-2120

Delaware
Chief, Office of Planning, Research and Evaluation
Delaware Department of Labor
University Plaza Office Complex
Building D
Chapman Road–Route 273
Newark, Delaware 19713
Phone: (302) 368-6962

District of Columbia
Chief, Division of Labor Market Information, Research, and Analysis
D.C. Department of Employment Services
500 C Street, N.W. Room 411
Washington, D.C. 20001
Phone: (202) 724-2413

Florida
Chief, Bureau of Research and Analysis
Florida Department of Labor and Employment Security
Caldwell Building
Tallahassee, Florida 32301
Phone: (904) 488-6037

Georgia
Director, Labor Information Systems
Georgia Department of Labor
254 Washington Street, S.W.
Atlanta, Georgia 30334
Phone: (404) 656-3177

Hawaii	Chief, Research and Statistics Department of Labor and Industrial Relations P.O. Box 3680 Honolulu, Hawaii 96811 Phone: (808) 548-7639
Idaho	Chief, Research and Analysis Idaho Department of Employment P.O. Box 35 Boise, Idaho 83707 Phone: (208) 384-2755
Illinois	Manager, Research and Analysis Division Illinois Bureau of Employment Security 910 South Michigan Street (15th Floor) Chicago, Illinois 60605 Phone: (312) 793-2316
Indiana	Chief of Research Indiana Employment Security Division 10 North Senate Avenue Indianapolis, Indiana 46204 Phone: (317) 232-7702
Iowa	Chief, Research and Analysis Iowa Department of Job Service 1000 East Grand Avenue Des Moines, Iowa 50319 Phone: (515) 281-8181
Kansas	Chief, Research and Analysis Division of Employment Kansas Department of Human Resources 401 Topeka Avenue Topeka, Kansas 66603 Phone: (913) 296-5060
Kentucky	Chief, Research and Statistics Department of Human Resources 2nd Floor West 275 East Main Street Frankfort, Kentucky 40621 Phone: (502) 564-7976
Louisiana	Chief, Research and Statistics Section Louisiana State Department of Labor P.O. Box 44094—Capitol Station 1001 North 23rd Street Baton Rouge, Louisiana 70804 Phone: (504) 342-3141
Maine	Director, Division of Research and Analysis Bureau of Employment Security Maine Department of Labor 20 Union Street Augusta, Maine 04330 Phone: (207) 289-2271
Maryland	Director, Research and Analysis Division Maryland Department of Human Resources Employment Security Administration 1100 North Eutaw Street Baltimore, Maryland 21201 Phone: (301) 383-5000
Massachusetts	Director of Job Market Research Massachusetts Division of Employment Security Charles F. Hurley Bldg.—Government Center Boston, Massachusetts 02114 Phone: (617) 727-6556
Michigan	Director, Research and Statistics Division Michigan Employment Security Commission 7310 Woodward Avenue Detroit, Michigan 48202 Phone: (313) 876-5445
Minnesota	Research Director Research and Statistical Services Office Minnesota Department of Economic Security 390 North Robert Street, Room 517 St. Paul, Minnesota 55101 Phone: (612) 296-6545
Mississippi	Chief, Research and Statistics Division Mississippi Employment Security Commission P.O. Box 1699 Jackson, Mississippi 39205 Phone: (601) 961-7424
Missouri	Chief, Research and Statistics Missouri Division of Employment Security Department of Labor and Industrial Relations P.O. Box 59 Jefferson City, Missouri 65101 Phone: (314) 751-3215

Montana	Chief, Research and Analysis Employment Security Division Department of Labor and Industry P.O. Box 1728 Helena, Montana 59601 Phone: (406) 449-2430
Nebraska	Chief, Research and Statistics Division of Employment Nebraska Department of Labor P.O. Box 94600 Lincoln, Nebraska 68509 Phone: (402) 475-8451
Nevada	Chief, Employment Security Research Nevada Employment Security Department 500 East Third Street Carson City, Nevada 89713 Phone: (702) 885-4550
New Hampshire	Director, Economic Analysis and Reports New Hampshire Department of Employment Security 32 South Main Street Concord, New Hampshire 03301 Phone: (603) 224-3311–Ext. 251
New Jersey	Director, Division of Planning and Research N.J. Department of Labor and Industry P.O. Box 2765 Trenton, New Jersey 08625 Phone: (609) 292-2643
New Mexico	Chief, Research and Statistics Section Employment Services Division Department of Human Services 401 Broadway–3rd Floor P.O. Box 1928 Albuquerque, New Mexico 87103 Phone: (505) 842-3105
New York	Director, Division of Research and Statistics New York State Department of Labor State Campus–Building 12 Albany, New York 12240 Phone: (518) 457-6181
North Carolina	Director, Labor Market Information Division Employment Security Commission of North Carolina P.O. Box 25903 Raleigh, North Carolina 27611 Phone: (919) 733-2936
North Dakota	Chief, Research and Statistics North Dakota Employment Security Bureau P.O. Box 1537 Bismarck, North Dakota 58505 Phone: (701) 224-2868
Ohio	Director, Division of Research and Statistics Ohio Bureau of Employment Services 145 South Front Street Columbus, Ohio 43216 Phone: (614) 466-3240
Oklahoma	Chief, Research and Planning Division Oklahoma Employment Security Commission 310 Will Rogers Memorial Office Bldg. Oklahoma City, Oklahoma 73105 Phone: (405) 521-3735
Oregon	Assistant Administrator for Research and Statistics Employment Division Department of Human Resources 875 Union Street N.E. Salem, Oregon 97311 Phone: (503) 378-3220
Pennsylvania	Director, Research and Statistics Division Pennsylvania Department of Labor and Industry 7th and Forster Streets Harrisburg, Pennsylvania 17121 Phone: (717) 787-3265
Puerto Rico	Chief, Research and Statistics Division—Floor 15 Department of Labor and Human Resources Bureau of Employment Security Prudencio Rivera Martinez Building 505 Munoz Rivera Avenue Hato Rey, Puerto Rico 00918 Phone: (809) 754-5385

Rhode Island	Employment Security Research Supervisor Rhode Island Department of Employment Security 24 Mason Street Providence, Rhode Island 02903 Phone: (401) 277-3704
South Carolina	Director, Manpower Research and Analysis South Carolina Employment Security Commission P.O. Box 995 Columbia, South Carolina 29202 Phone: (803) 758-8983
South Dakota	Chief, Research and Statistics Office of Administrative Services Department of Labor P.O. Box 1730 Aberdeen, South Dakota 57401 Phone: (605) 622-2314
Tennessee	Chief, Research and Statistics Tennessee Department of Employment Security Cordell Hull Office Building, Room 519 436–6th Avenue, North Nashville, Tennessee 37219 Phone: (615) 741-2284
Texas	Chief, Economic Research and Analysis Texas Employment Commission 1117 Trinity Street Austin, Texas 78701 Phone: (512) 397-4540
Utah	Director, Research and Analysis Utah Department of Employment Security P.O. Box 11249 Salt Lake City, Utah 84147 Phone: (801) 533-2014
Vermont	Director of Administrative Services Vermont Department of Employment Security P.O. Box 488 Montpelier, Vermont 05602 Phone: (802) 229-0311
Virginia	Commissioner, Virginia Employment Commission P.O. Box 1358 Richmond, Virginia 23211 Phone: (804) 786-3001
Washington	Chief, Research and Statistics Employment Security Department Employment Security Building 212 Maple Park Olympia, Washington 98504 Phone: (206) 753-5224
West Virginia	Chief, Division of Labor and Economic Research Department of Employment Security 112 California Avenue Charleston, West Virginia 25305 Phone: (304) 885-2660
Wisconsin	Director, Bureau of Research and Statistics Department of Industry, Labor, and Human Relations P.O. Box 7944 Madison, Wisconsin 53707 Phone: (608) 266-7034
Wyoming	Chief, Reports and Analysis Section Employment Security Commission P.O. Box 2760 Casper, Wyoming 82601 Phone: (307) 237-3703

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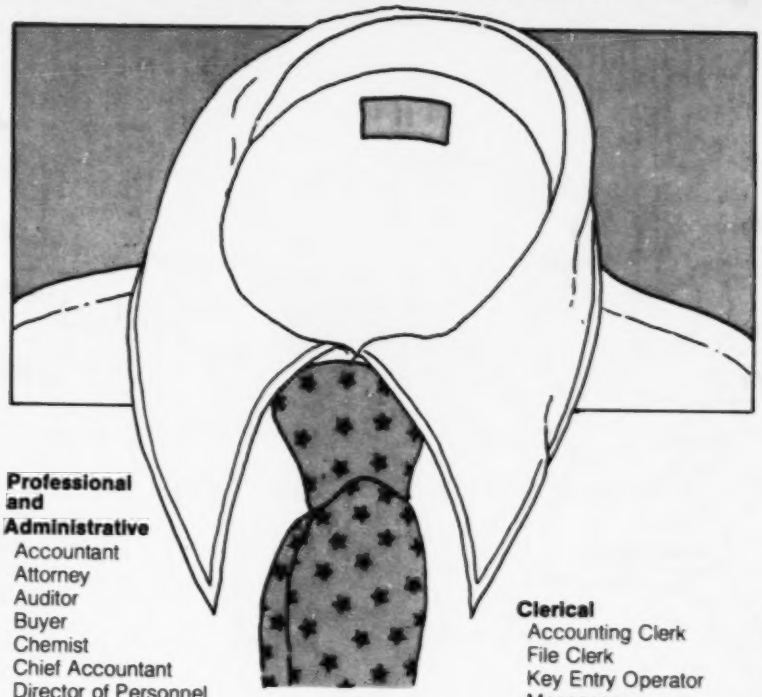
A Report on White-Collar Salaries by Occupation

from the Bureau of Labor Statistics



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